DEPARTMENT OF THE ARMY TECHNICAL MANUAL **TM 5-3805-210-1**

DEPARTMENT OF THE AIR FORCE TECHNICAL ORDER **TO 36C9-2-16**

OPERATOR'S MANUAL

GRADER, ROAD, MOTORIZED: DIESEL DRIVEN; 12,100 TO 14,300 LB PRESSURE AT BLADE; (HUBER-WARCO MODEL 4D) FSN 3805-542-2995 WINTERIZED FSN 3805-542-2996 NONWINTERIZED

This copy is a reprint which includes current pages from Changes 1 and 4

DEPARTMENTS OF THE ARMY AND THE AIR FORCE

AUGUST 1962

Operator's Manual

GRADER, ROAD, MOTORIZED: DIESEL DRIVEN; 12,100 TO 14,300 LB PRESSURE AT BLADE; (HUBER-WARCO MODEL 4D) FSN 3805–542–2995 WINTERIZED FSN 3805–542–2996 NONWINTERIZED

TM 5–3805–210–10
TO 36C9–2–16–1
CHANGES No. 1

DEPARTMENTS OF THE ARMY
AND THE AIR FORCE
WASHINGTON 25, D. C., *5 April 1963*

TM 5–3805–210–10/TO 36C9–2–16–1, 7 August 1962, is changed as follows:

Page 3, paragraph 1*d,* lines 4 and 5. Delete "Engineer Maintenance Center, ATTN: EMCDM–S," and substitute Mobility Support Center, ATTN: SMOMS–MS,.

Paragraph 1.

e. (Superseded) Report all equipment improvement recommendations as prescribed by TM 38–750.

Page 11, paragraph 7*a.* Delete "before starting engine" and substitute preventive maintenance.

Page 20, paragraph 13*a.*(1). Delete "before-starting engine" and substitute preventive maintenance.

Paragraph 14*b.* Delete "after-operation" and substitute preventive maintenance.

Section III. PREVENTIVE MAINTENANCE SERVICES
(Superseded)

32. General
(Superseded)

To insure that the grader is ready for operation at all times, it must be inspected systematically, so that defects may be discovered and corrected before they result in serious damage or failure. The necessary Preventive Maintenance Services to be performed are listed and described in paragraph 33. The item numbers indicate the sequence of minimum inspection requirements. Defects discovered during operation of the unit shall be noted for future correction, to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noted during operation which would damage the equipment if operation were continued. All deficiencies and shortcomings will be recorded, together with the corrective action taken, on DA Form 2404 at the earliest possible opportunity.

33. Daily Preventive Maintenance Services
(Superseded)

This paragraph contains an illustrated tabulated listing of preventive maintenance services which must be performed by the operator. The item numbers are listed consecutively and indicate the sequence of minimum requirements. Refer to figure 15 for the Daily Preventive Maintenance Services.

Page 81, paragraph 5, line 1. Delete entirely.

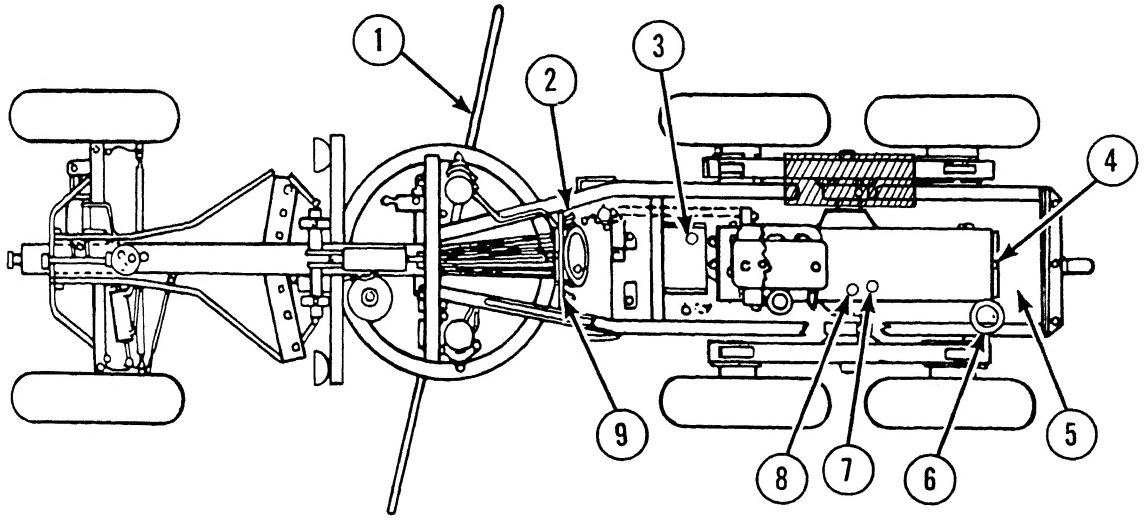
Page 84, paragraph 3, lines 4 and 5. Delete "Engineer Maintenance Center, ATTN: EMCDM–S," and substitute "Mobility Support Center, ATTN: SMOMS–MS,".

PREVENTIVE MAINTENANCE SERVICES

DAILY

TM 5-3805-210-10 ROAD GRADER

HUBER-WARCO MODEL 4D



LUBRICATE IN ACCORDANCE WITH CURRENT LUBRICATION ORDER

ITEM		PAR. REF
1	MOLDBOARD, CUTTING EDGE, AND END BITS. Inspect for breaks and wear. Tighten loose mounting hardware. Replace cutting edge and end bits if worn within 3/4 inch of moldboard. (Biweekly)	
2	FIRE EXTINGUISHER. Check for broken seal.	
3	FUEL TANK. Check fuel level.	
4	RADIATOR. Check for proper coolant level. Proper coolant level is 1-1/2 inch below overflow pipe.	
5	BATTERIES. Check cables for loose connections. Check electrolyte level. Correct level is 3/8 inch above the plates. Do not add water in freezing weather unless engine is to be operated immediately. (Weekly)	
6	AIR CLEANER AND PRECLEANER. Check oil level. Add oil to level mark. Clean precleaner before it is 3/4 full of dirt. (Biweekly)	

Figure 15. (Superseded) *Daily preventive maintenance services.*

ITEM		PAR. REF
7	FUEL FILTER. Inspect for leaks. Drain water and sediment. (Biweekly)	
8	OIL LEVEL GAGE. Check oil level. Fill to FULL mark on gage.	
9	INSTRUMENTS. Check for normal operation. Normal operating readings for instruments should be as follows: Water temperature gage - 160 to 180°F, Oil pressure gage - 40 to 60 psi, Fuel pressure gage - RUN range, Ammeter - 0 to 60+, Battery indicator - GREEN range, Tachometer - 550 to 1,940 rpm as applicable.	

MSC 3805-210-10/15

Figure 15—Continued.

By Order of the Secretaries of the Army and the Air Force:

EARLE G. WHEELER,
General, United States Army,
Chief of Staff.

Official:
J. C. LAMBERT,
Major General, United States Army,
The Adjutant General.

CURTIS E. LEMAY,
Chief of Staff, United States Air Force.

Official:
R. J. PUGH,
Colonel, United States Air Force,
Director of Administrative Services.

Distribution:

Active Army:

USASA (2)	Engr Dep (OS) (10)	5–38
DCSLOG (1)	Army Dep (2)	5–45
CNGB (1)	USA Trans Tml Comd (2)	5–46
TSG (1)	Army Tml (1)	5–48
CofEngrs (3)	USAOSA (2)	5–54
CSigO (1)	Engr Dist (2)	5–115
CofT (1)	Div Engr (2)	5–117
USA Maint Bd (1)	Engr Fld Maint Shops (2)	5–127
USAARTYBD (2)	USAERDL (3)	5–145
USAARMBD (2)	Engr Cen (5)	5–146
USAIB (2)	AMS (3)	5–155
USARADBD (2)	Chicago Engr Proc Ofc (10)	5–156
USA Abn Elect & SPWAR Bd (2)	USA Mbl Spt Cen (36)	5–237 (5)
	ESCO (10)	5–262 (5)
USAAVNBD (2)	Fld Comd, DASA (8)	5–267 (1)
USCONARC (3)	USACOMZEUR (2)	5–278 (5)
USAMC (5)	USAREUR Engr Sup Con Agcy (10)	5–279
OS Maj Comd (5) except USARJ (10)		5–420
	USAREUR Engr Proc Cen (2)	5–425
MDW (1)		5–427
Armies (2)	MAAG (1)	5–500 (Tms EA, EB, HD, HE, HF, HG)
Corps (2)	JBUSMC (1)	
USA Corps (1)	Units org under fol TOE: (2 cy ea UNOINDC)	5–600
Div (2)		5–625
Engr Bde (1)	5–5	5–627
USMA (2)	5–6	7–100
Svc Colleges (2)	5–15	17–100
Br Svc Sch (2) except USAES ( )	5–16	37–100
	5–35	39–51
GENDEP (OS) (10)	5–36	39–61

NG: State AG (3).

USAR: Units—same as Active Army except allowance is one copy to each unit.

For explanation of abbreviations used see AR 320–50.

TM 5-3805-210-10
TO 36C9-2-16-1
*C 4

Change No. 4

DEPARTMENTS OF THE ARMY
AND THE AIR FORCE
Washington, D. C., *17 July 1973*

Operator's Manual
GRADER, ROAD, MOTORIZED: DIESEL DRIVEN; 12,100 TO 14,300 LB. PRESSURE AT BLADE; (HUBER-WARCO MODEL 4D)
FSN 3805-542-2995 WINTERIZED
FSN 3805-542-2996 NON-WINTERIZED

TM 5-3805-210-10, 7 August 1962, is changed as follows:

Page 1. In the table of contents, "I. REFERENCES" is changed to read "Appendix I. REFERENCES."

Page 1. In the table of contents, "II. BASIC ISSUE ITEMS LIST" is changed to read "Appendix II. BASIC ISSUE ITEM LIST AND ITEMS TROOP INSTALLED OR AUTHORIZED."

Page 3. Subparagraph 1*d* is superseded as follows:

d. You can improve this manual by calling attention to errors and by recommending improvements, using DA Form 2028 (Recommended Changes to Publications), or by letter, and mailing directly to Commander, U.S. Army Troop Support Command, ATTN: AMSTS-MP, 4300 Goodfellow Blvd., St. Louis, MO. 63120.

Page 7. Subparagraph 4*b*(14) is superseded as follows:

(14) *Maintenance and Operating supplies.* Refer to chart on pages 8 and 9 for a complete list of maintenance and operating supplies required for initial operation.

Page 22. In figure 5, callout 2 is superseded as follows:

2. PLACE HAND THROTTLE IN CLOSED POSITION.

Page 68. Paragraph 74 is superseded as follows:

74. Service Brake Adjustment

a. Minor Adjustment. The free brake pedal movement should be 3/4 to 1 inch (measured from pedal pad to bottom of floor plate) before plunger moves master cylinder piston. Perform the minor adjustment as follows:

(1) Check the master cylinder fluid level (fill to 1/2 inch from top with an approved brake fluid).

(2) Check pedal movement (3/4 to 1 inch).

(3) Remove the adjustment hold covers on backing plates.

(4) Expand brake shoes by turning adjusting screw until the shoe linings are against the drums.

(5) Back the adjusting screw off three notches and replace the adjusting hole covers.

NOTE

If proper brake action is not obtained by minor adjustment perform the major adjustment as described in *b* below.

b. Major Adjustment.

(1) Check fluid level.

(2) Check pedal free travel.

(3) Loosen lock nuts on anchor pins and move anchor pin until point of arrow faces center.

(4) Move brake adjusting and feeler gage hole covers on backing plates.

*This change supersedes C 3, 2 April 1968.

(5) Loosen lock nuts on centralizing bracket.

(6) Turn adjusting screw until brake shoe linings are expanded against the drums.

(7) Tighten centralizing bracket locknuts.

(8) Back off adjusting screw until a clearance of 0.014 inch is obtained between the bottom of the shoe linings and the drum.

(9) Turn anchor pins in the reverse direction until a clearance of 0.008 inch is obtained between the top of the lining and the drum.

(10) Tighten anchor pin nuts.

(11) Recheck bottom clearance for 0.014 inch and readjust if necessary.

(12) Tap backing plate with light hammer to insure the centralizer is taking the correct position between the shoe ends.

(13) Replace all hole covers.

NOTE

Refer to figure 29 for service brake adjustment.

Page 69. In figure 29, Step 2 is superseded as follows:

2. TURN ADJUSTING SCREW UP UNTIL BRAKE SHOES AND LININGS ARE EXPANDED TIGHTLY AGAINST INSIDE OF BRAKE DRUM. TURN ADJUSTING SCREW DOWN THREE CLICKS.

Page 83. Appendix II is superseded as follows:

APPENDIX II
BASIC ISSUE ITEM LIST AND ITEMS TROOP INSTALLED OR AUTHORIZED

Section I. INTRODUCTION

C-1. Scope

This appendix lists basic issue items, items troop installed or authorized which accompany the grader and are required by the crew/operator for operation, installation, or operator's maintenance.

C-2. General

This basic issue items, items troop installed or authorized list is divided into the following sections:

a. Basic Issue Items List—Section II. Not applicable

b. Items troop Installed or Authorized List—Section III. A list in alphabetical sequence of items which at the discretion of the unit commander may accompany the end item, but are NOT subject to be turned in with the end item.

C-3. Explanation of Columns

The following provides an explanation of columns in the tabular list of Basic Issue Items List, Section II, and Items Troop Installed or Authorized, Section III.

a. Source, Maintenance, and Recoverability Code(S) (SMR): Not applicable.

b. Federal Stock Number. This column indicates the Federal stock number assigned to the item and will be used for requisitioning purposes.

c. Description. This column indicates the Federal item name any additional description of the item required.

d. Unit of Measure (U/M). A 2-character alphabetic abbreviation indicating the amount or quantity of the item upon which the allowances are based e.g., ft, ea, pr, etc.

e. Quantity Authorized (Items Troop Installed or Authorized Only). This column indicates the quantity of the item authorized to be used with the equipment.

Section III. ITEMS TROOP INSTALLED OR AUTHORIZED LIST

(1) SMR code	(2) Federal stock No.	(3) Description Ref. No. & Mfr code / Usable on code	(4) Unit of meas	(5) Qty auth
	4210-889-2221	EXTINGUISHER, FIRE	EA	1

By Order of the Secretaries of the Army and the Air Force:

CREIGHTON W. ABRAMS
General, United States Army
Chief of Staff

Official:

VERNE L. BOWERS
Major General, United States Army
The Adjutant General

JOHN D. RYAN, *General, USAF*
Chief of Staff

Official:

DWIGHT W. COVELL, *Colonel, USAF*
Director of Administration

Distribution:
To be distributed in accordance with DA Form 12-25B (qty rqr block No. 393) Operator's Maintenance requirements for Graders.

*TM 5–3805–210–10/TO 36C9–2–16–1

TECHNICAL MANUAL
No. 5–3805–210–10
TECHNICAL ORDER
No. 36C9–2–16–1

DEPARTMENTS OF THE ARMY
AND THE AIR FORCE
WASHINGTON 25, D.C., *7 August 1962*

OPERATOR'S MANUAL

GRADER, ROAD, MOTORIZED: DIESEL DRIVEN; 12,100 TO 14,300 LB PRESSURE AT BLADE; (HUBER-WARCO MODEL 4D) FSN 3805–542–2995 WINTERIZED FSN 3805–542–2996 NONWINTERIZED

*This manual supersedes TM 5–3805–210–10, 4 May 1960, including C 1, 9 October 1961, and C 2, 10 January 1962.

CHAPTER 1
INTRODUCTION

Section I. GENERAL

1. Scope

a. These instructions are published for the use of the personnel to whom the Huber-Warco Model 4D Grader is issued. They provide information on the operation, lubrication, and preventive maintenance services of the equipment, accessories, components, and attachments.

b. Appendix I contains a list of applicable publications. Appendix II contains a list of the basic issue items authorized for use by the operator. The maintenance allocation chart is located in TM 5–3805–210–20.

c. Numbers in parentheses on illustrations indicate quantity. Numbers preceding nomenclature callouts on illustrations indicate the preferred maintenance sequence.

d. Report all deficiencies in this manual on DA Form 2028. Submit recommendations for changes, additions, or deletions to the Commanding Officer, U.S. Army Engineer Maintenance Center, ATTN: EMCDM–S, P.O. Box 119, Columbus 16 Ohio. Direct communication is authorized.

e. Report unsatisfactory equipment performance and suggestions for equipment improvement to the organizational unit for initiating necessary corrective action.

2. Record and Report Forms

For record and report forms applicable to the operator, refer to TM 38–750.

Note. Applicable forms, excluding standard Form 46 which is carried by the operator, shall be kept in a canvas bag mounted on the equipment.

Section II. DESCRIPTION AND DATA

3. Description

The Huber-Warco Model 4D is a 6 wheel pneumatic-tired road grader. It is driven by a 4-cylinder diesel engine and is equipped with two chain drive assemblies which transmit power to the tandem drive wheels. The chain drives are located in the tandem drive cases (fig. 1) and operate in oil. The grader is equipped with a hydraulic control system which receives its power from an engine-mounted hydraulic pump. The hydraulic control levers are located on the dash directly in front of the operator's seat and control the operation of the circle side shift cylinder (fig. 1) and the blade lift cylinders (fig. 2), circle reverse assembly, leaning wheel tie bar, and the scarifier lift cylinder. The grader is equipped with a 12-foot moldboard assembly and an eleven-tooth scarifier assembly. The grader has two independent brake systems. One brake system is hydraulically controlled and operated by a foot pedal; the other brake system is mechanically controlled by a hand lever. The grader is equipped with a five-speed transmission, four forward speeds and one reverse. An overdrive transfer lever allows the operator to select a high or low speed range in any one of the forward or reverse gears. The grader is equipped with a 24-volt electrical system which consists of four 12-volt batteries connected in series parallel, a generator, voltage regulator, and starter.

4. Identification and Tabulated Data

a. Identification. The road grader has ten identification plates.

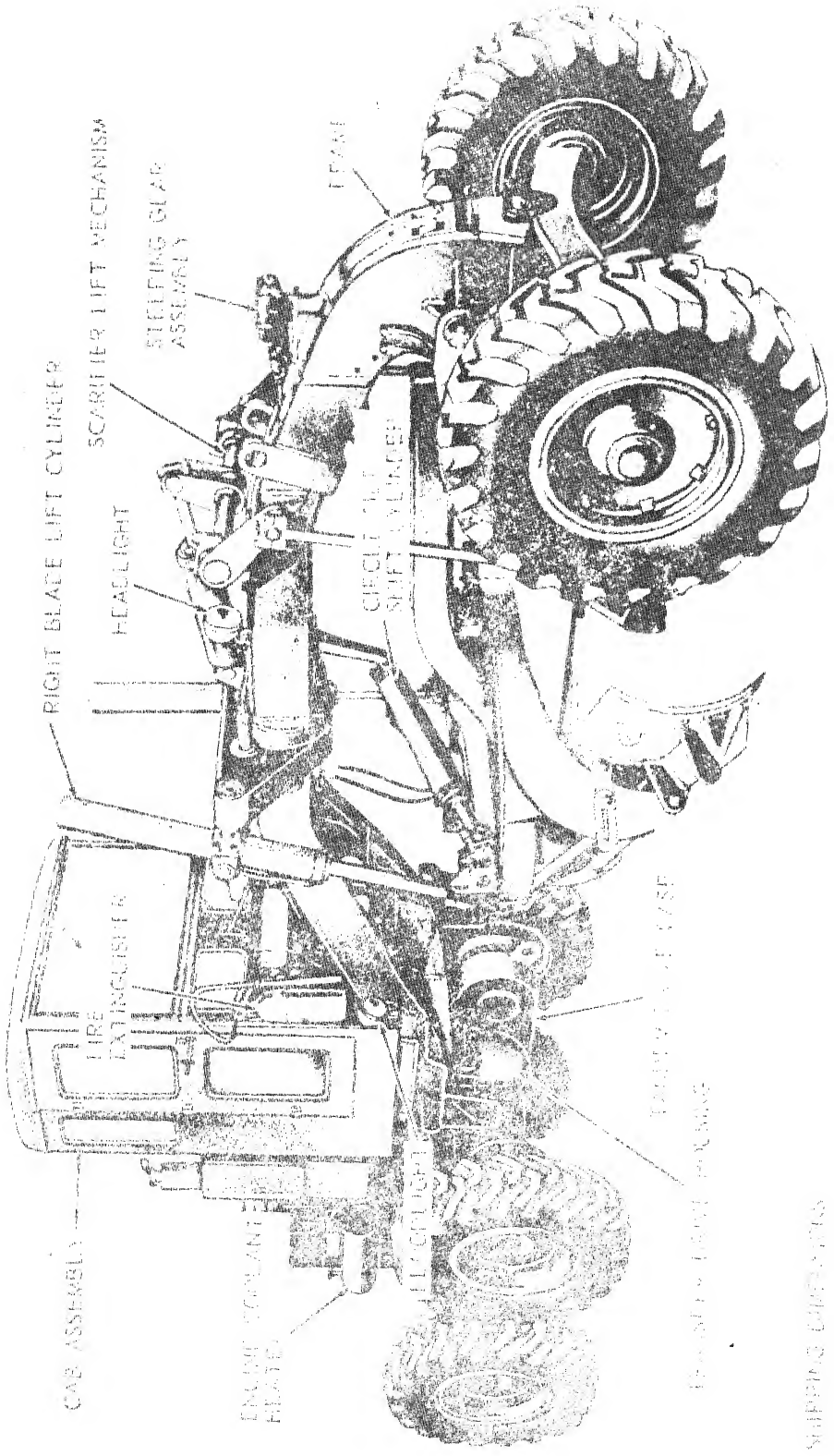


Figure 1. Road grader, right-front, three-quarter view.

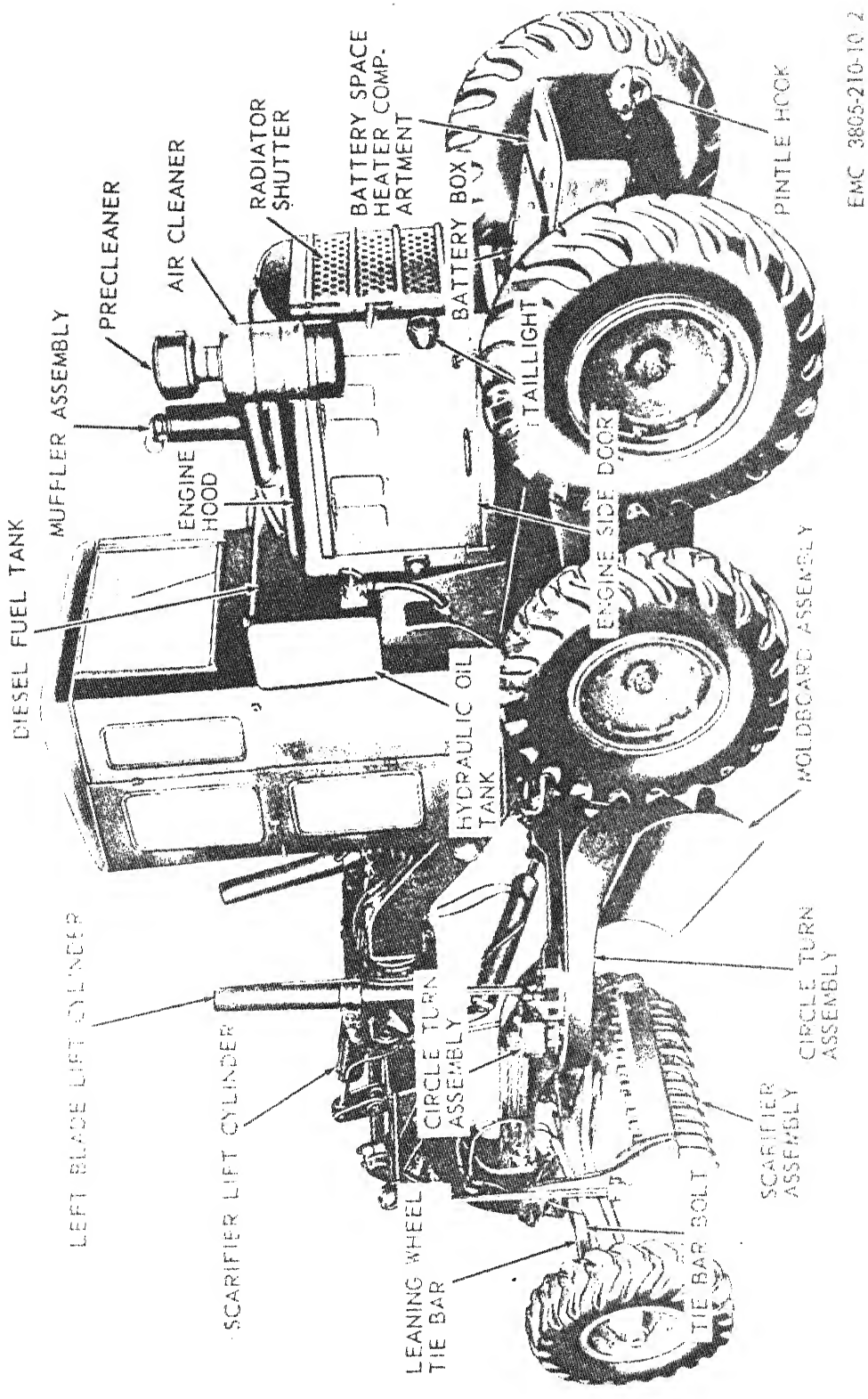


Figure 2. Road grader, left-rear, three-quarter view.

(1) *Corps of Engineers unit identification plate.* Located on the left side of the frame above the front axle. Specifies the nomenclature, Federal stock number, manufacturer, model, date manufactured, serial number, contract number, and USA registration number. Also specifies make, model, and serial number of the engine.

(2) *Corps of Engineers scarifier data plate.* Located on the left side of the scarifier arm. Specifies the nomenclature, make, model, serial number, and date of manufacture. Also specifies the nomenclature, make, model, and Federal stock number of the road grader.

(3) *Hydraulic lift cylinder caution plate.* Located on the inside of the cab to the right of the operator's seat. Specifies precautions to be observed when side-shifting the circle and drawbar to maximum right or left and when raising the blade lift cylinders with the blade in the right- or left-hand ditching position.

(4) *Engine data plate.* Located on the left side of the engine on the rocker arm cover. Specifies the model, unit serial number, and maximum revolutions per minute of the engine with no load.

(5) *Gearshift diagram plate.* Located on the right side of the dash panel. Illustrates the shifting positions of the transmission gearshift lever and transfer drive gearshift lever.

(6) *Winterization control schematic diagram plate.* Located on the inside of the cab to the left of the operator's seat. Illustrates a complete schematic diagram of the winterization system.

(7) *Air cleaner instruction plate.* Located on the outer oil cup of the air cleaner. Gives instructions and intervals for servicing the air cleaner. Also gives manufacturer's name.

(8) *Lifting attachment capacities plate.* Located to the rear of, and beside the transportation data plate. Specifies the lifting capacities in pounds of the lifting eyes located on the front and rear of the grader.

(9) *Transportation data plata.* Located on the lower-left side panel of the operator's cab. Specifies the overall length, height, and width of the grader. Also specifies the height reducible to, shipping cubage, shipping weight, and shipping tonnage of the grader with and without a cab.

(10) *Transmission data plate.* Located on the left-front side of the transmission case. Specifies the make, specification number, and serial number of the transmission.

b. Tabulated Data.

(1) *Road grader.*

Manufacturer	Huber-Warco Co.
Model	4D
Serial number range:	
Winterized	MD–101W thru MD–125W, and MD–810W thru MD–829W
Nonwinterized	MD–126 thru MD–806, and MD–830 thru MD–1107

(2) *Engine.*

Manufacturer	Detroit Diesel Engine Div. of General Motors Corp.
Model	4025
Type	Diesel two cycle
Cylinders	4
Compression ratio	17 to 1
Firing order	1–3–4–2
Maximum rpm no load	1,940 rpm (revolutions per minute)

(3) *Engine air cleaner.*

Manufacturer	Nichols Metals Mfg. Co., Inc.
Model	A–12509
Type	Oil bath

(4) *Engine coolant heater.*

Manufacturer	Perfection Industries, Div. of Hupp Corp.
Model	MH–60–D1
Capacity	60,000 Btu (British thermal units) per hour.
Voltage	24

(5) *Space heater.*

Manufacturer	Perfection Industries, Div. of Hupp Corp.
Model	MH–30–B–2
Capacity	30,000 Btu per hr
Voltage	24

(6) *Primary fuel filters.*

Manufacturer	AC Division of General Motors Corp.

Model ---------- T–60
Element type ---------- Disposable

(7) *Secondary fuel filter.*

Manufacturer ---------- AC Division of General Motors Corp.
Model ---------- T–58
Element type ---------- Disposable

(8) *Primary oil filter.*

Manufacturer ---------- AC Division of General Motors Corp.
Model ---------- 5193288
Element type ---------- Disposable

(9) *Batteries.*

Volts ---------- 12
Type ---------- 6TN
Number required ---------- 4

(10) *Tires.*

Size ---------- 13.00 x 24.
Ply ---------- 8
Pressure ---------- 25 psi (pounds per square inch) (increase tire pressure 25% for maintenance work on established highways).

(11) *Capacities.*

Fuel tank ---------- 50 gal (gallons)
Cooling system ---------- 34 qt (quarts)
Crankcase ---------- 18 qt
Air cleaner ---------- 4–1/2 qt
Transmission ---------- 48 qt
Transfer drive ---------- 6 qt
Tandem drive case ---------- 28 qt ea (each)
Circle reverse case ---------- 3 qt
Steering gear ---------- 1 qt
Hydraulic system ---------- 30 gal
Hydraulic tank ---------- 16–1/2 gal
Hydraulic brake system ---------- 1 pt (pint)

(12) *Adjustment data.*

Fan, water pump, and generator belts. 1/2 in. (inches) deflection between pulleys.

(13) *Dimensions and weights.*

Overall length ---------- 311 in.
Overall width ---------- 96 in.
Overall height with cab ---------- 127 in.
Overall height without cab. 111 in.
Height reducible to ---------- 93 in.
Shipping cubage with cab ---------- 2,167 cu ft (cubic feet)
Shipping cubage without cab. 1,860 cu ft
Shipping tonnage with cab. 54 tons
Shipping tonnage without cab. 47 tons
Shipping weight with cab ---------- 25,180 lb (pounds)
Shipping weight without cab. 24,780 lb

(14) *Maintenance and operating supplies.* Refer to chart below for a complete list of maintenance and operating supplies required for initial operation.

Item	Component application	Source of supply	Federal stock No.	Description	Quantity required for initial operation	Quantity required for 8 hours operation	Notes
1.	0101 CRANKCASE (1)			OIL, LUBRICATING: 55-gal drum, as follows:			(1) Includes quantity of oil to fill engine oil system as follows: 16 qt—Crankcase 2 qt—Oil Filters
		10	9150-231-6655	Grade 9250 or	18 qt	(2)	
		10	9150-265-9436	OE-30			
		10	9150-231-9039	Grade 9110 or	18 qt	(2)	
		10	9150-265-9429	OE-10			
		10	9150-242-7604	OES	18 qt	(2)	
2.	0304 AIR CLEANER (3)			OIL, LUBRICATING (3)	4-1/2 qt	(2)	
3.	0306 TANK, FUEL			FUEL OIL, DIESEL: Bulk, as follows:			(2) See LO 5-3805-210-20 for grade application and replenishment intervals.
		10	9140-286-5294	Regular Grade (DF-2)	50 gal (4)	38 gal (5)	
		10	9140-286-5286	Winter Grade (DF-1)	50 gal (4)	38 gal (5)	
		10	9140-286-5283	or Arctic Grade (DF-A)	50 gal (4)	38 gal (5)	
4.	0501 RADIATOR			WATER:	34 qt		(3) Use oil as prescribed in item (1) above.
		9	6850-243-1990	ANTIFREEZE: Ethylene glycol			
		9	6850-174-1806	ANTIFREEZE: Compound Arctic			(4) Tank capacity.
5.	0700 TRANSMISSION			OIL, LUBRICATING, GEAR: 55-gal drum, as follows:			(5) Average fuel consumption is 4-3/4 gph of continuous operation.
		10	9150-243-3190	Grade 3120 or	48 qt	(2)	
		10	9150-577-5848	GO-140			
		10	9150-223-8894	Grade 3100 or	48 qt	(2)	
		10	9150-577-5845	GO-90			
		10	9150-257-5442	GOS	48 qt	(2)	
6.	0801 TRANSFER DRIVE CASE (6)			OIL LUBRICATING, GEAR: (6)	6 qt	(2)	(6) Use oil as prescribed in item (5) above.
7.	1110 TANDEM DRIVE ASSEMBLY			OIL, LUBRICATING, GEAR: 55-gal drum, as follows:			
		10	9150-223-8894	Grade 3100 or	28 qt ea	(2)	
		10	9150-577-5845	GO-90			
		10	9150-257-5442	GOS	28 qt ea	(2)	

Maintenance and Operating Supplies—Continued.

Item	Component application	Source of supply	Federal stock No.	Description	Quantity required for initial operation	Quantity required for 8 hours operation	Notes
8.	1204.1 HYDRAULIC BRAKE SYSTEM			HYDRAULIC FLUID, NON-PETROLEUM BASE: 1-gal can, as follows:			
		10	9150-231-9071	HB	1 pt	(2)	
9.	1401 STEERING GEARCASE (6)			OIL, LUBRICATING, GEAR: (6)	1 qt	(2)	
10.	4300 HYDRAULIC SYSTEM			OIL, LUBRICATING, HYDRAULIC: 55-gal drum as follows:			
		10	9150-265-7303	2135-H or	30 gal	(2)	
		10	9150-261-8286	2110-H or	30 gal	(2)	
		10	9150-257-5439	2075-H	30 gal	(2)	
11.	7411.3 CIRCLE REVERSE GEARCASE (6)			OIL, LUBRICATING, GEAR: (6)	3 qt	(2)	
12.	GREASE POINTS			GREASE, AUTOMOTIVE AND ARTILLERY: 35-pound pail, as follows:			
		10	9150-190-0907	GAA	As rqr	(2)	

5. Difference in Models

This manual covers the Huber-Warco Model 4D motorized road grader, winterized and nonwinterized. The winterized serial number range is MD–101W through MD–125W and MD–810 through MD–829. The nonwinterized serial number range is MD–126 through MD–806 and MD–830 through MD–1107. Machines in serial range MD–810 through MD–1107 have been improved over machines in serial range MD–101W through MD–806W as follows: oil level plugs in the transfer case, transmission, and tandem drive have been replaced with dipsticks. All standard plugs have been replaced with magnetic plugs and gaskets. A guide and adapter have been utilized to receive an extended crankcase oil level gage, which permits the operator to check the crankcase oil level with the side panel in place. Three ether starting aids are used in place of the one previously used. The instrument panel has been revised and contains a horn button. A tachometer, calibrated from 0 to 2,500 rpm, is located in the center of the instrument panel. The coolant temperature gage is graduated from 120° to 240°. The oil pressure gage is graduated from 0 to 120 psi. A horn button is located on the right side of the instrument panel. The position of all switches and gages has been changed; all switches with exception of the instrument panel light switch are grouped in the lower, left corner. All gages are located on the slope of the instrument panel in full view of the operator. The ammeter has been replaced by a battery indicator gage.

CHAPTER 2
INSTALLATION AND OPERATION INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

6. Unloading The Road Grader

The operator of the road grader may assist in unloading the equipment from the common carrier. The operator will help remove tie-down cables, strapping, blocking, and the like which secure the equipment. The operator will drive the road grader down the ramp when hoisting equipment is not available, using the following procedures:

a. Start the engine (par. 18).

b. Run the machine on the flatcar until it is in alinement with the ramp.

c. Test brakes before approaching ramp.

Warning: **Be sure the flatcar is blocked so it cannot move.**

7. Inspecting and Servicing The Road Grader

Note. Make sure the road grader is completely deprocessed before servicing. Make sure preservatives have been removed from such items as the crankcase, transmission, transfer case, air cleaner, tandem drive housings, fuel tanks, hydraulic tanks, and gearcases.

a. Perform the before starting engine services listed in paragraph 33.

b. Inspect to see that the required tools, repair parts, publications, accessories, and attachments are with the road grader.

c. Inspect the road grader for loss of parts or damage which may have occurred during loading, removal, or shipment.

d. Report all damage or deficiencies to organizational maintenance.

8. Installation or Setting-up Instructions

A bolt (fig. 2) is installed in the leaning wheel tie bar to secure the tie bar to the front axle during shipment; this maintains the front wheels in the vertical position. Remove this bolt before putting the road grader into operation. No further installation or setting-up instructions are required to prepare the road grader for operation.

9. Movement to a New Work Site

The road grader can be moved to a new work site under its own power or hauled by common carrier. No disassembly is required for movement to a new work site.

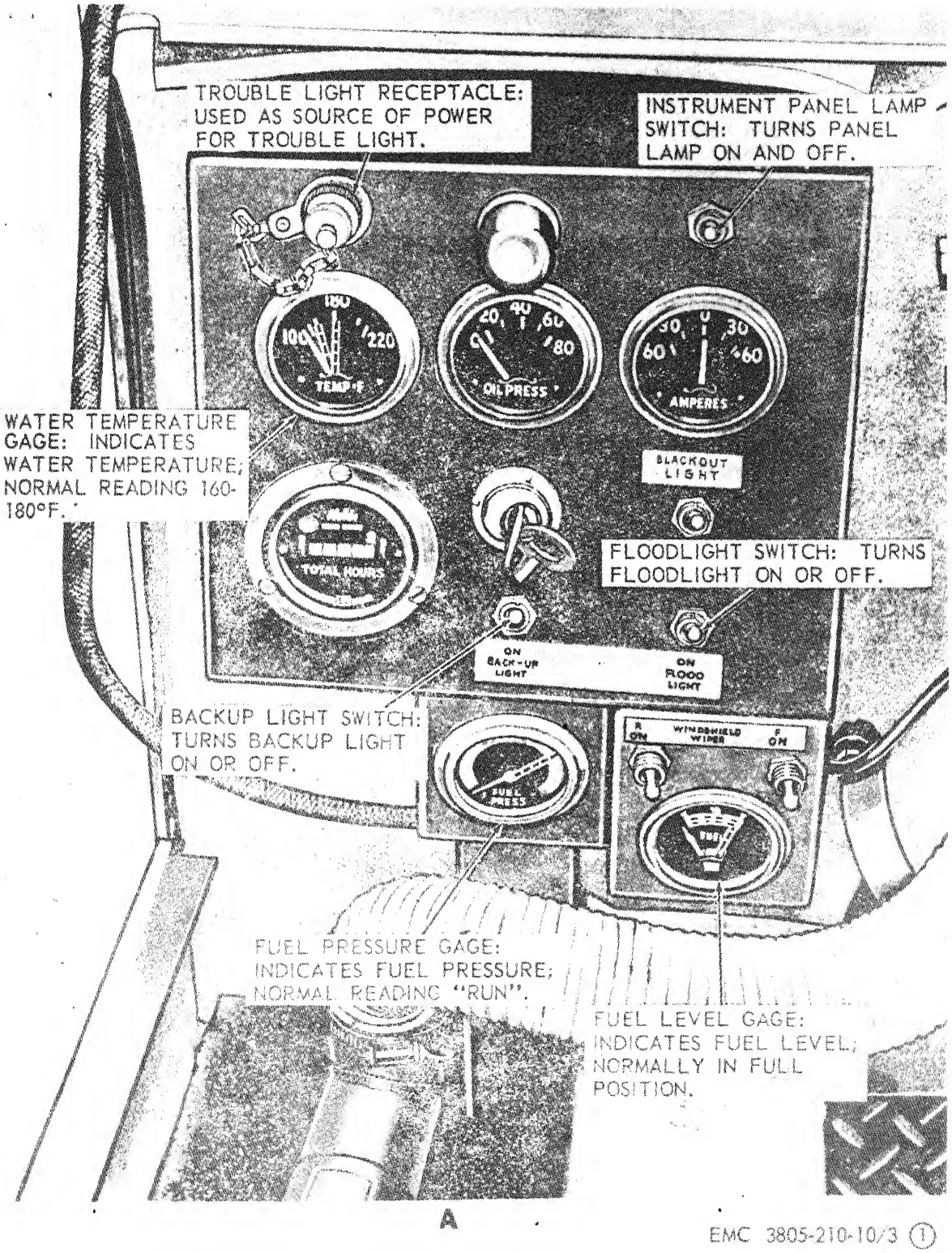
Section II. CONTROLS AND INSTRUMENTS

10. General

This section describes, locates, illustrates, and furnishes the operator, crew, or driver sufficient information about the various controls and instruments for proper operation of the road grader.

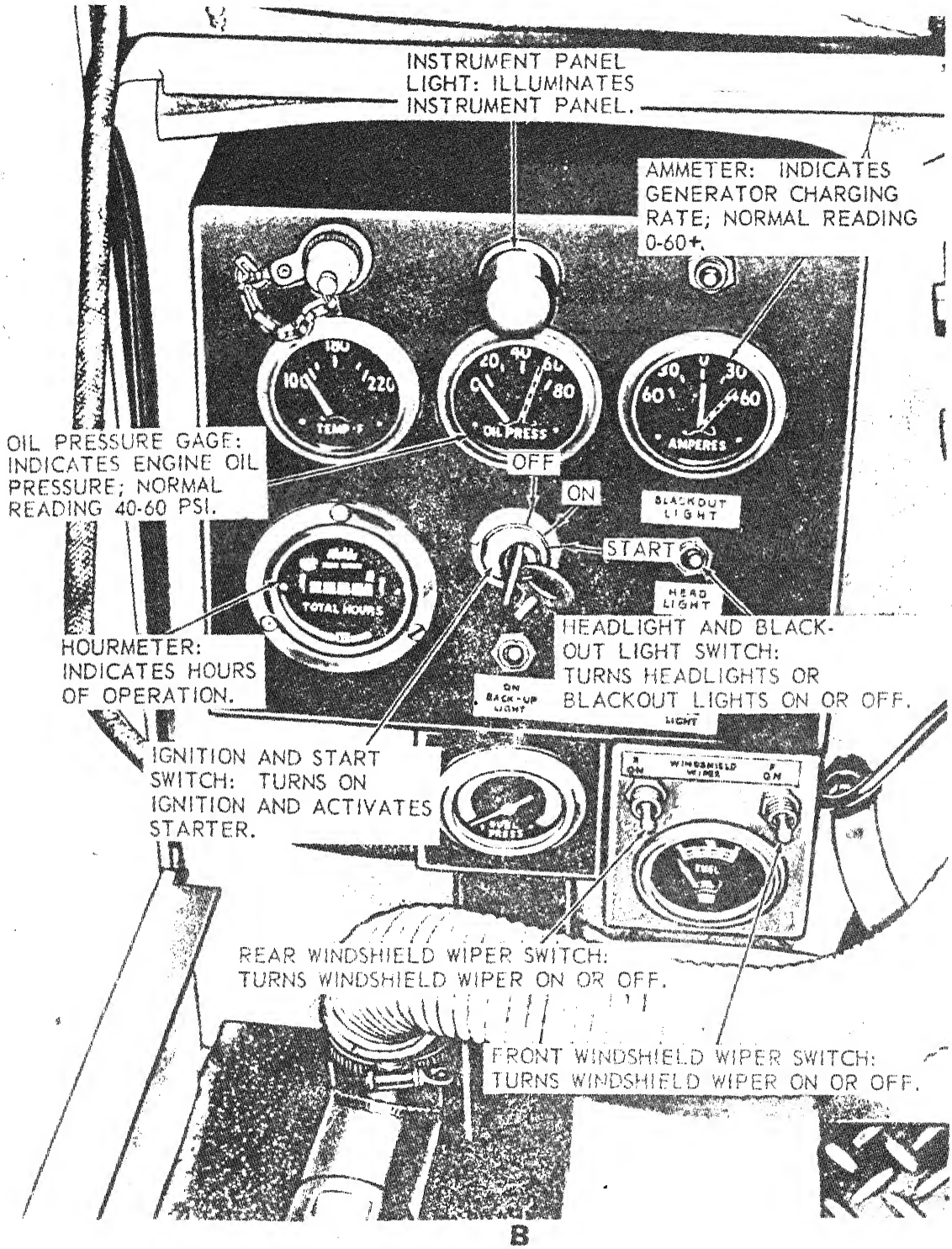
11. Controls and Instruments

The purpose and normal reading of all controls and instruments are illustrated on figure 8.



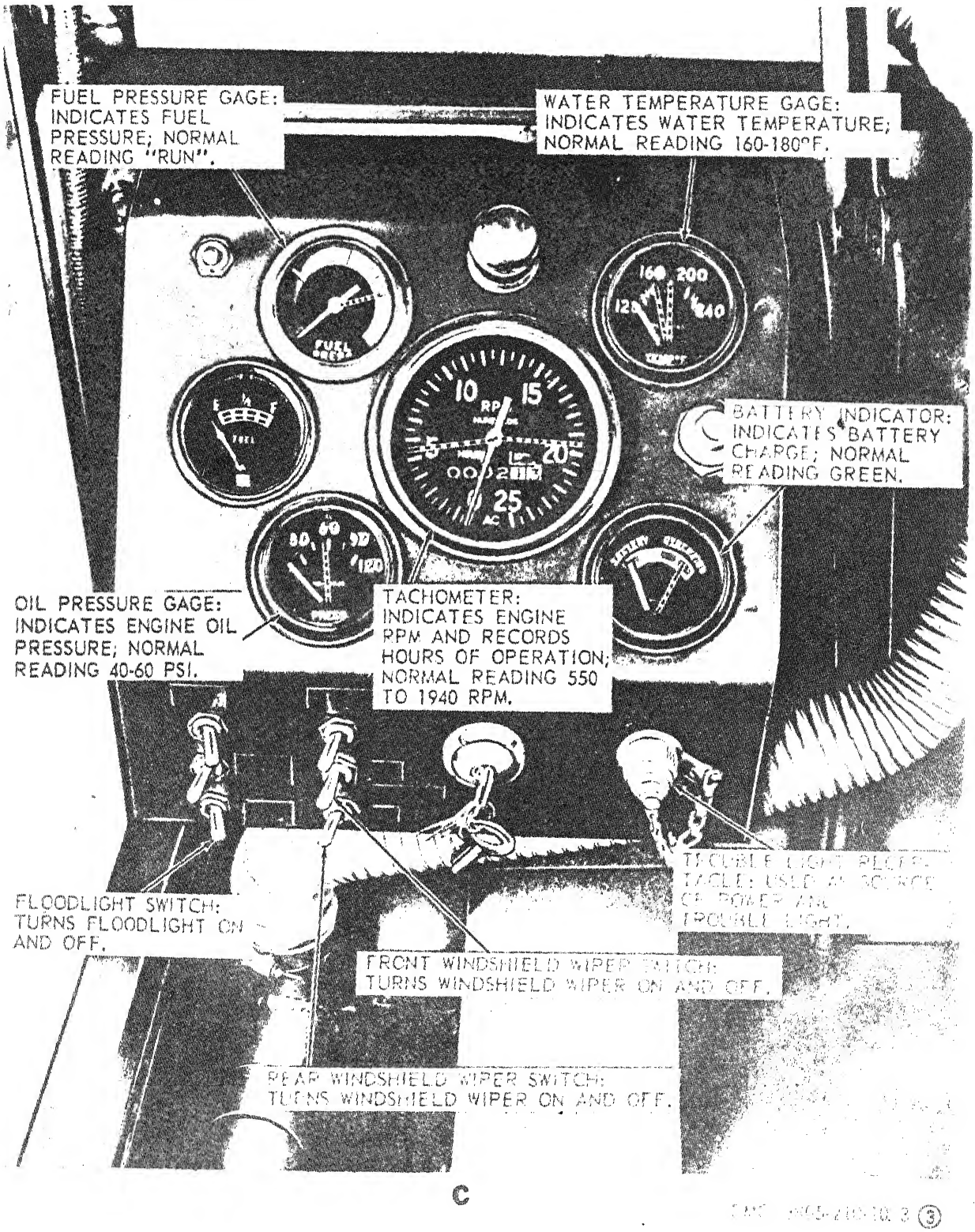
A—Engine instrument panel (Serial range MD–101W through MD–806)

Figure 3. Controls and instruments.



B—Engine instrument panel (Serial range MD–101W through MD–806)

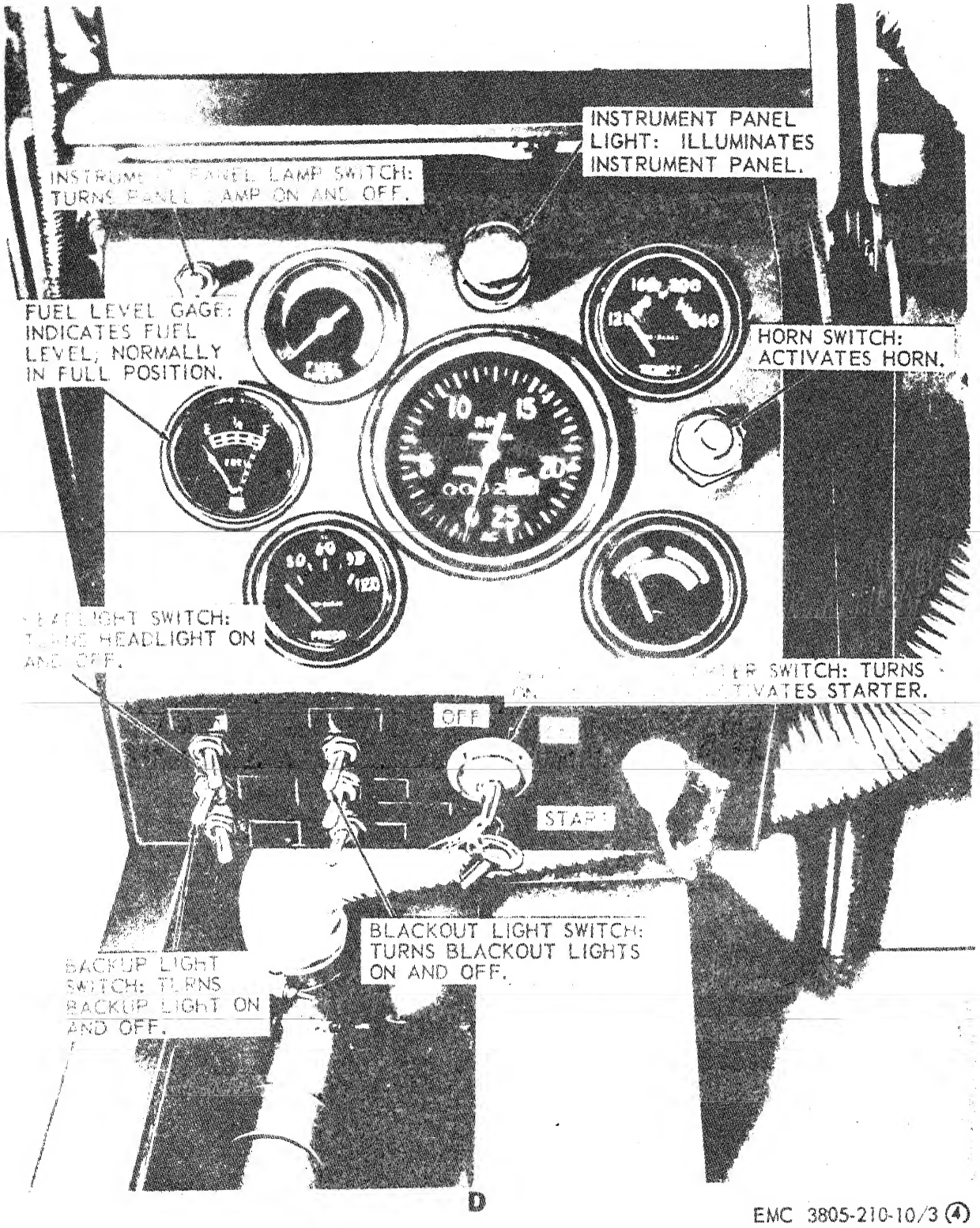
Figure 3—Continued.



C

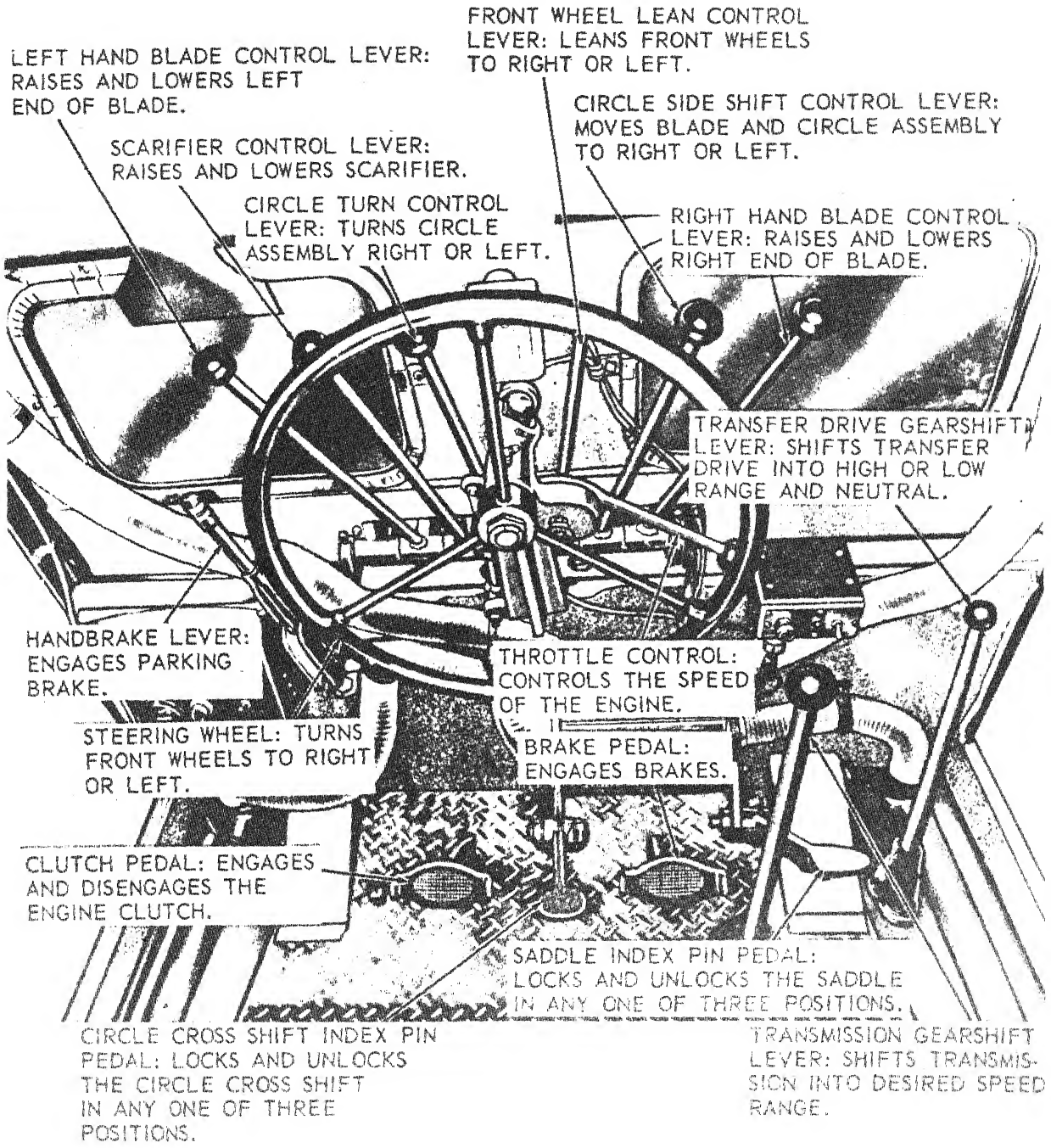
C—Engine instrument panel (Serial range MD–810W through MD–1107)

Figure 3—Continued.



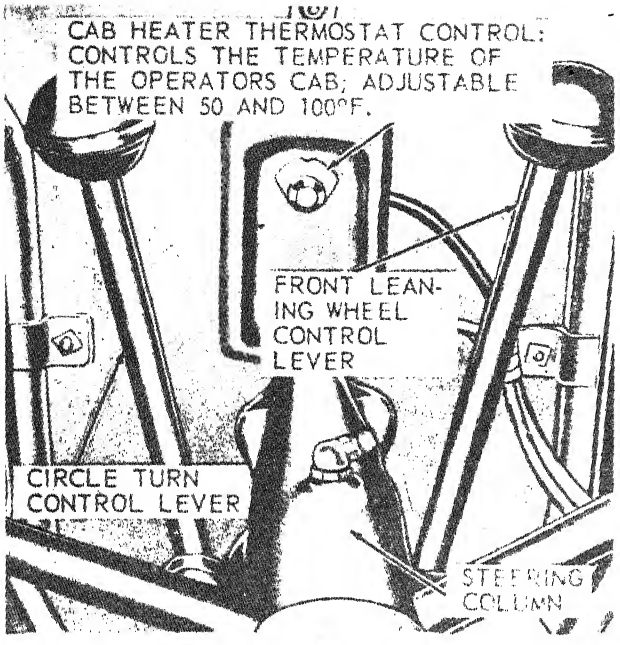
D—**Engine instrument panel (Serial range MD–810W through MD–1107)**

Figure 3—Continued.



E—Operator's control levers and pedals

Figure 3—Continued.



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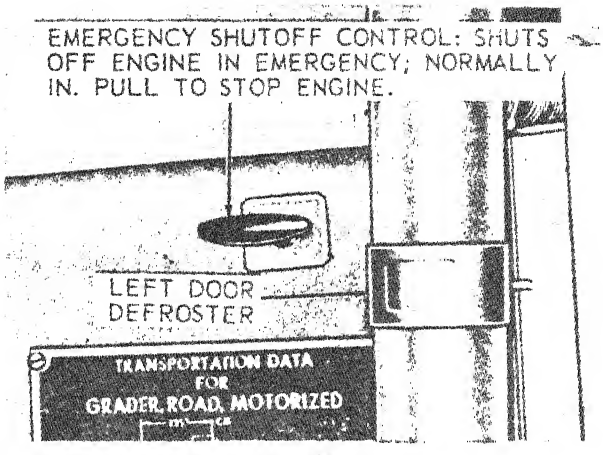
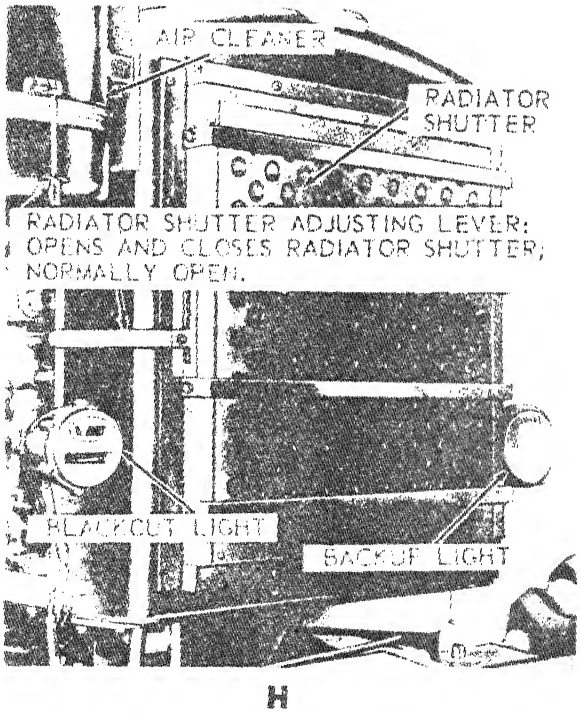


G

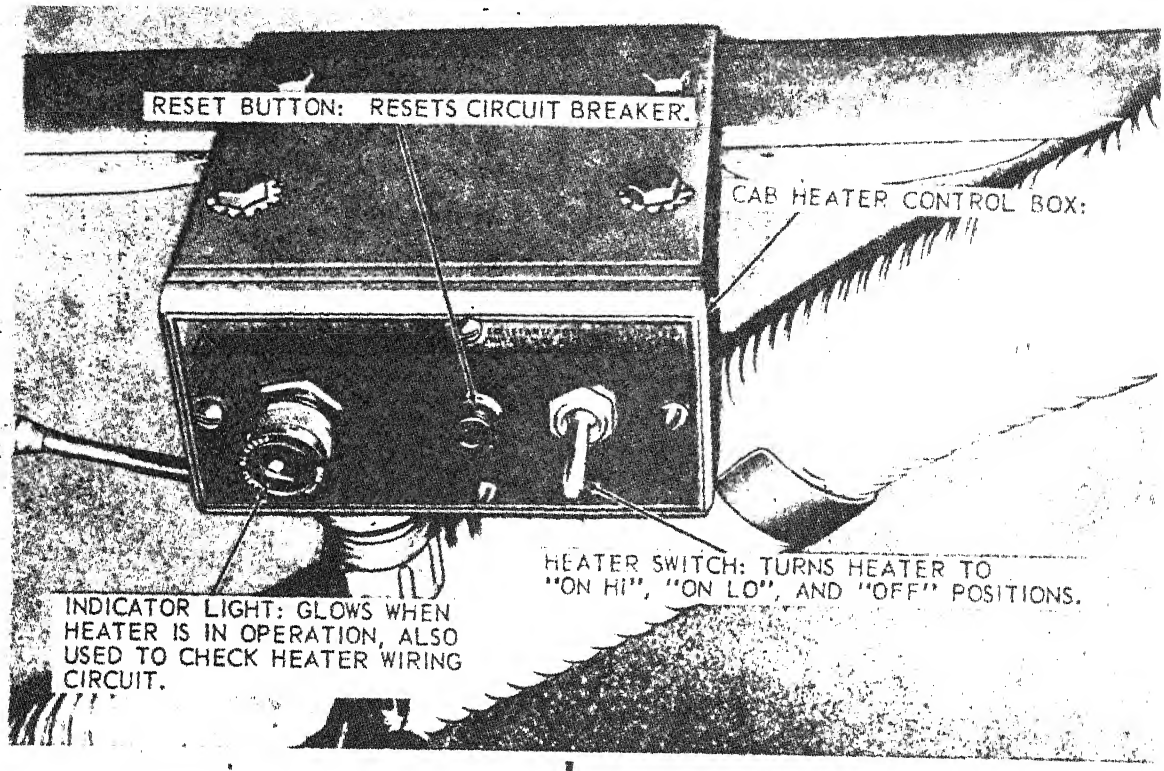


H

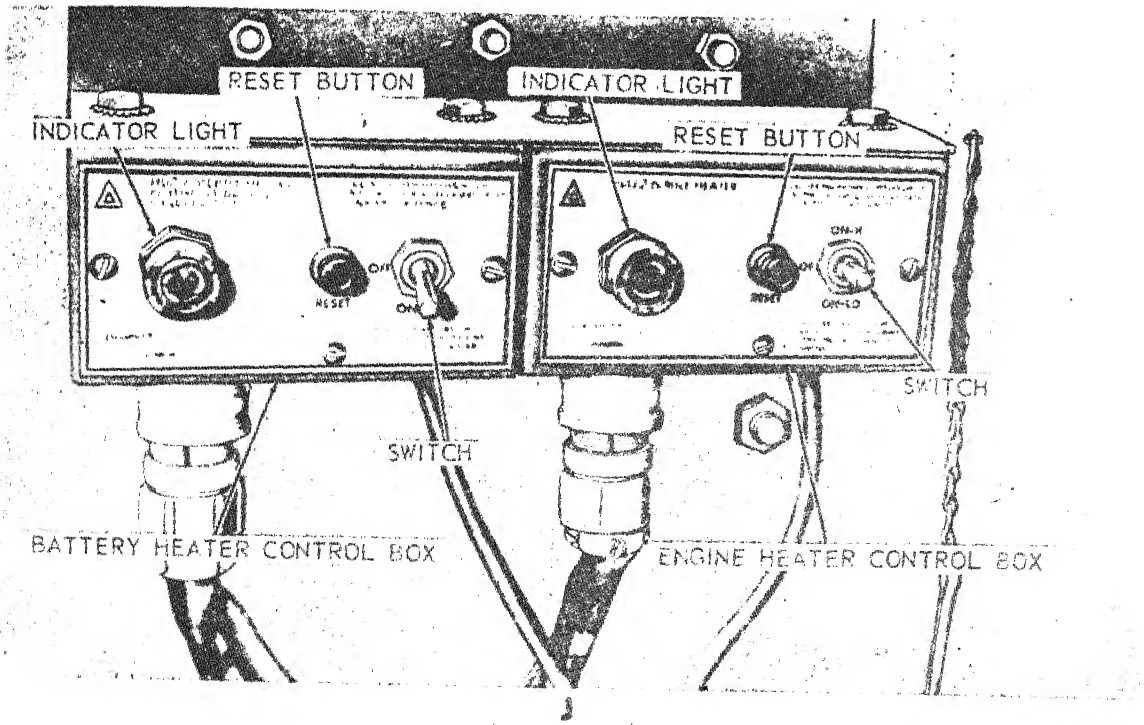
EMC 3805-210-10/3 (6)

F—Cab heater thermostat control G—Emergency shutoff control H—Radiator shutter adjustment

Figure 3—Continued.



I



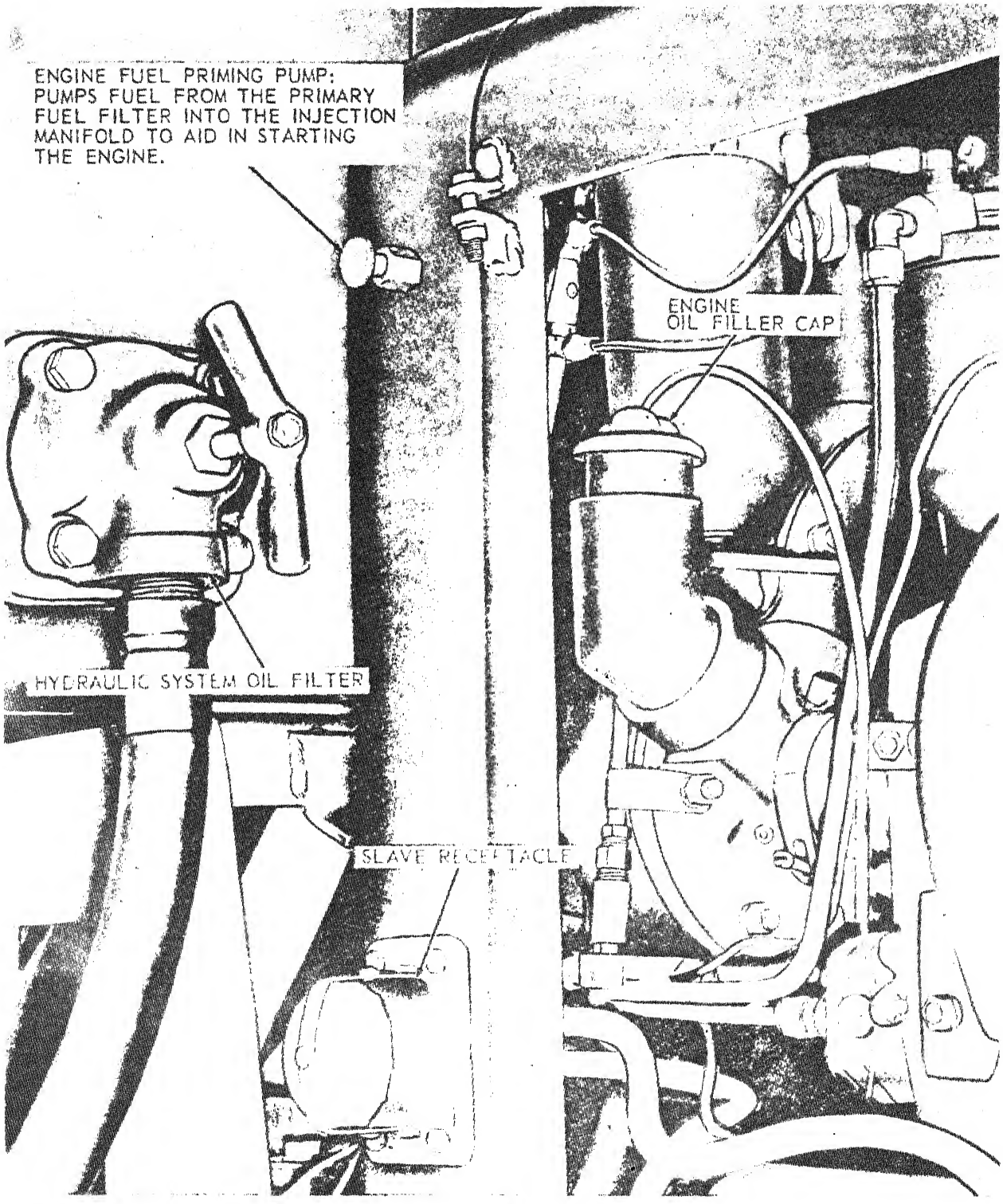
J

EMC 3805-210-10/3 ⑦

I—Cab heater control box

J—Battery and engine heater control boxes

Figure 3—Continued.



K—Priming pump, hydraulic oil filter, and slave receptacle

Figure 3—Continued.

Section III. OPERATION OF EQUIPMENT

12. General

a. The instructions in this section are published for the information and guidance of the personnel responsible for operation of the road grader.

b. The operator must know how to perform every operation of which the road grader is capable. This section gives instructions on starting and stopping the road grader, basic motions of the road grader, and instructions on coordinating the basic motions to perform the specific tasks for which the equipment is designed. Since nearly every job presents a different problem, the operator may have to vary given procedures to fit the individual job.

13. Starting The Road Grader Engine

a. Preparation for Starting.

(1) Perform the before-starting engine services (par. 33).

(2) Lubricate the road grader as specified in the current lubrication order (LO 5–3805–210–20).

b. Starting the Engine. Start the engine as instructed on figure 4.

14. Stopping The Road Grader Engine

a. Stop the engine as instructed on figure 5.

b. Perform the after-operation services (par. 33).

15. Road Grader Operation

a. General. The road grader is used in the construction and maintenance of roads, general grading, and snow removal. The raising, lowering, tilting, and side-shifting of the blade, and raising and lowering of the scarifier can be accomplished by the operator while the grader is in motion.

b. Operating the Road Grader.

(1) Start the engine (par. 13).

(2) Operate the road grader as instructed on figure 6.

c. Earthworking Operation. The various earthworking operations of which the road grader is capable are illustrated on figure 7.

16. Operation in Extreme Cold (Below 0°F.)

a. See that antifreeze solution has been checked and is correct for the lowest possible temperature expected.

b. Inspect cooling system and report any leaks.

c. Keep batteries fully charged. After adding water, run engine at least one hour.

d. Keep fuel tank full at all times to prevent condensation.

e. Drain and service fuel filters frequently (par. 57 and 58).

f. Use the engine coolant heater and battery heater to warm the engine oil, coolant, and batteries before starting engine. Allow engine to warm up before applying load.

g. Lubricate as specified in the current lubrication order (LO 5–3805–210–20).

17. Operation in Extreme Heat

a. Cooling. Inspect radiator core frequently to make it clean and free of obstructions.

b. Grader. Inspect instruments and gages frequently to make sure grader is not being overloaded. Reduce depth of cut if necessary.

c. Lubrication. Check oil levels frequently as extreme heat may cause excessive oil consumption.

18. Operation in Dusty or Sandy Areas

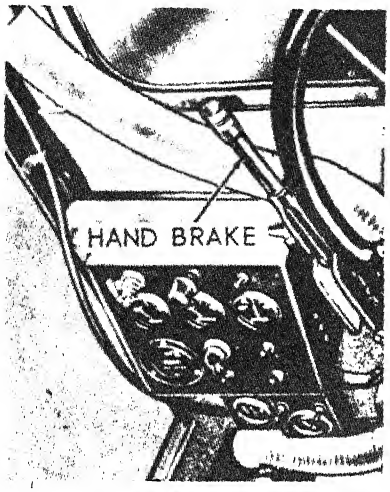
a. Fuel. Strain fuel before adding to fuel tank. Prevent sand from entering fuel while pouring. Service air cleaner frequently to remove sand and dust.

b. Lubrication. Clean all lubrication points before applying lubricants. Clean areas around oil filler cap and oil level gage before inspecting or adding engine oil (par. 31).

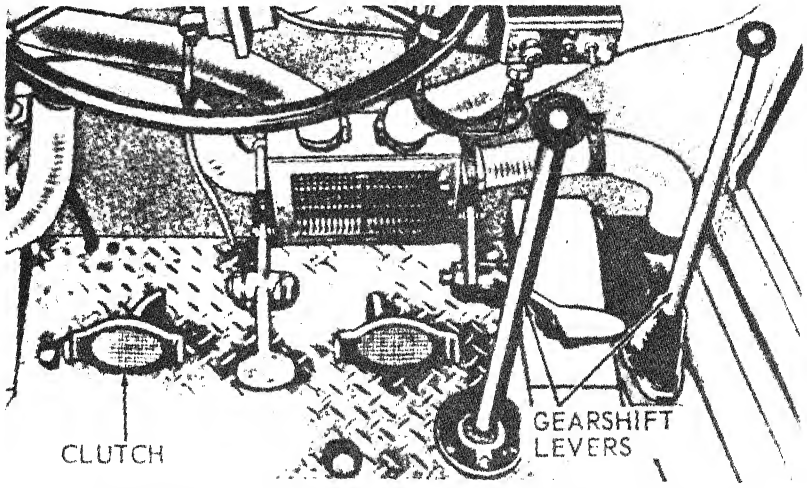
c. Protection. Protect the grader when not in operation by covering with tarpaulins and taking advantage of natural barriers to prevent dust and sand from entering components of the grader.

19. Operation Under Rainy or Humid Conditions

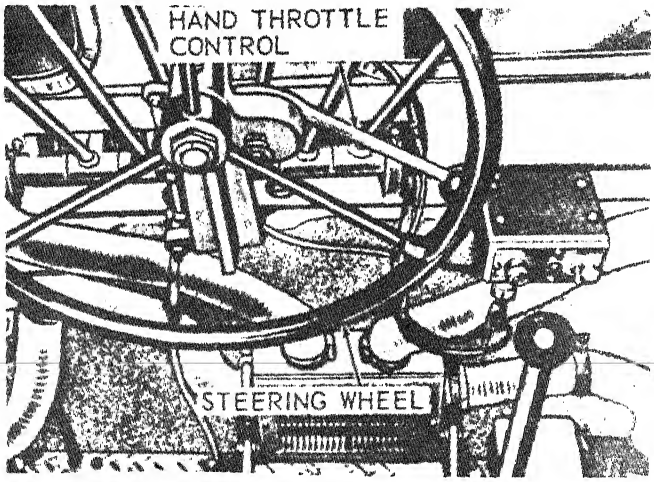
If unit is outside and not operating, protect it with a canvas or other waterproof cover. Remove cover during dry periods. Open housing



1. ENGAGE HANDBRAKE.

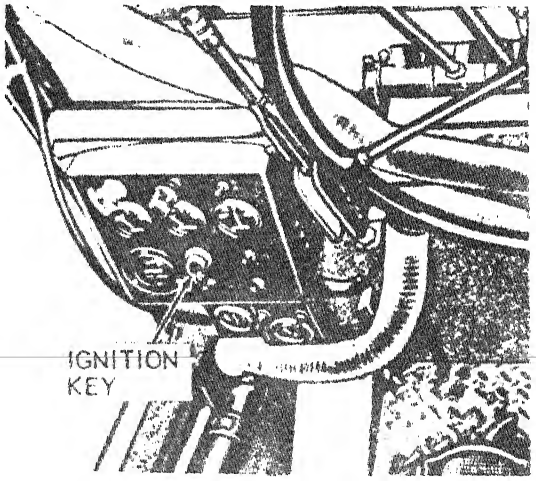


2. DEPRESS CLUTCH AND PLACE GEARSHIFT LEVERS IN NEUTRAL POSITION.



3. PLACE HAND THROTTLE CONTROL IN ONE-HALF ENGINE SPEED POSITION.

NOTE: DO NOT ENGAGE THE STARTING MOTOR FOR MORE THAN 30 SECONDS AT ONE TIME. EXCESSIVE HEAT MAY DAMAGE THE STARTING MOTOR.



4. TURN IGNITION KEY TO THE START POSITION. RELEASE KEY WHEN ENGINE STARTS.

5. WHEN ENGINE STARTS PLACE THE THROTTLE CONTROL IN JUST ABOVE IDLE POSITION AND PLACE THE TRANSFER GEAR SHIFT LEVER IN FORWARD OR REVERSE POSITION. ALLOW ENGINE TO WARM UP BEFORE PUTTING GRADER IN OPERATION.

NOTE: DO NOT LEAVE THE TRANSFER GEAR SHIFT LEVER IN THE NEUTRAL POSITION FOR MORE THAN A FEW MOMENTS. THE TRANSFER DRIVE INPUT SHAFT BEARINGS DO NOT RECEIVE LUBRICATION IN THE NEUTRAL POSITION.

Figure 4. Starting the road grader engine.

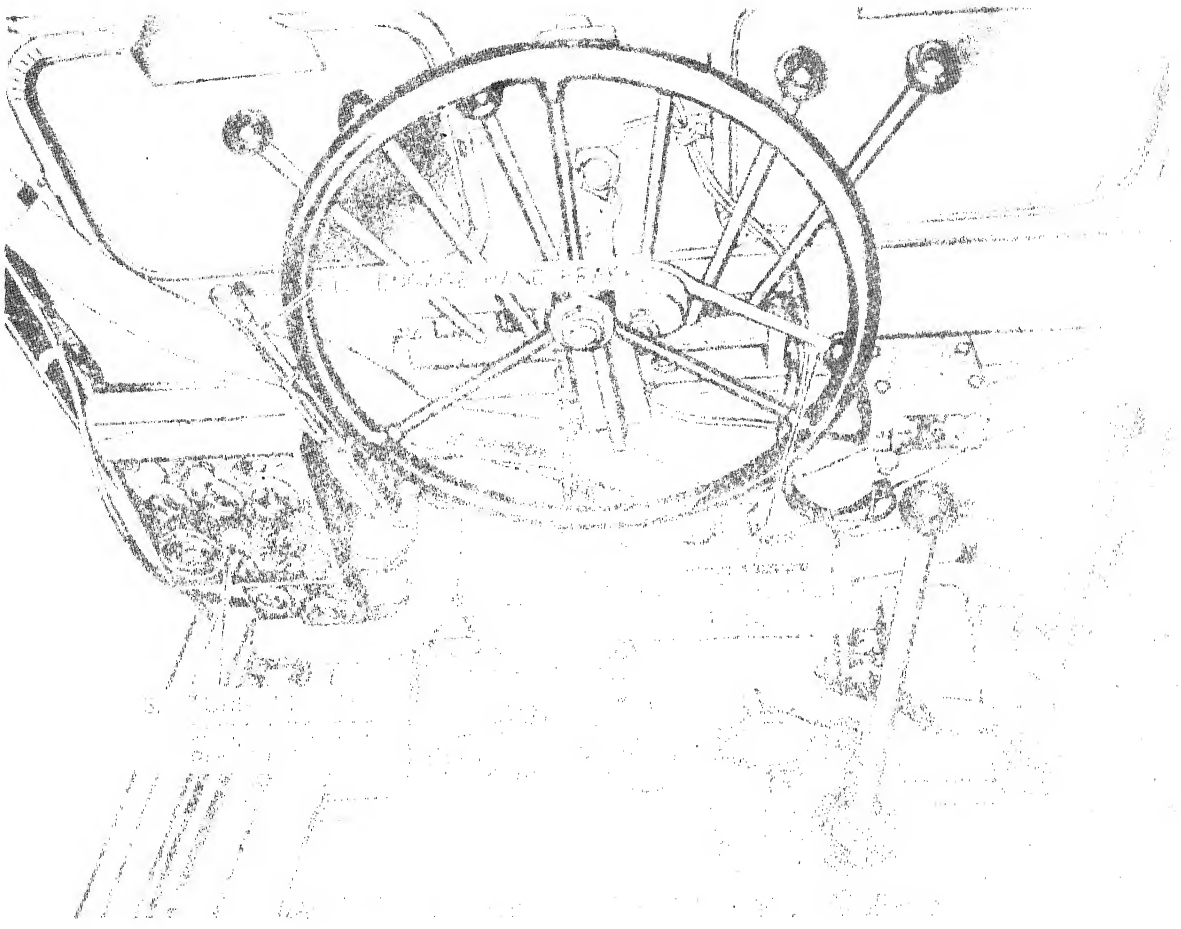
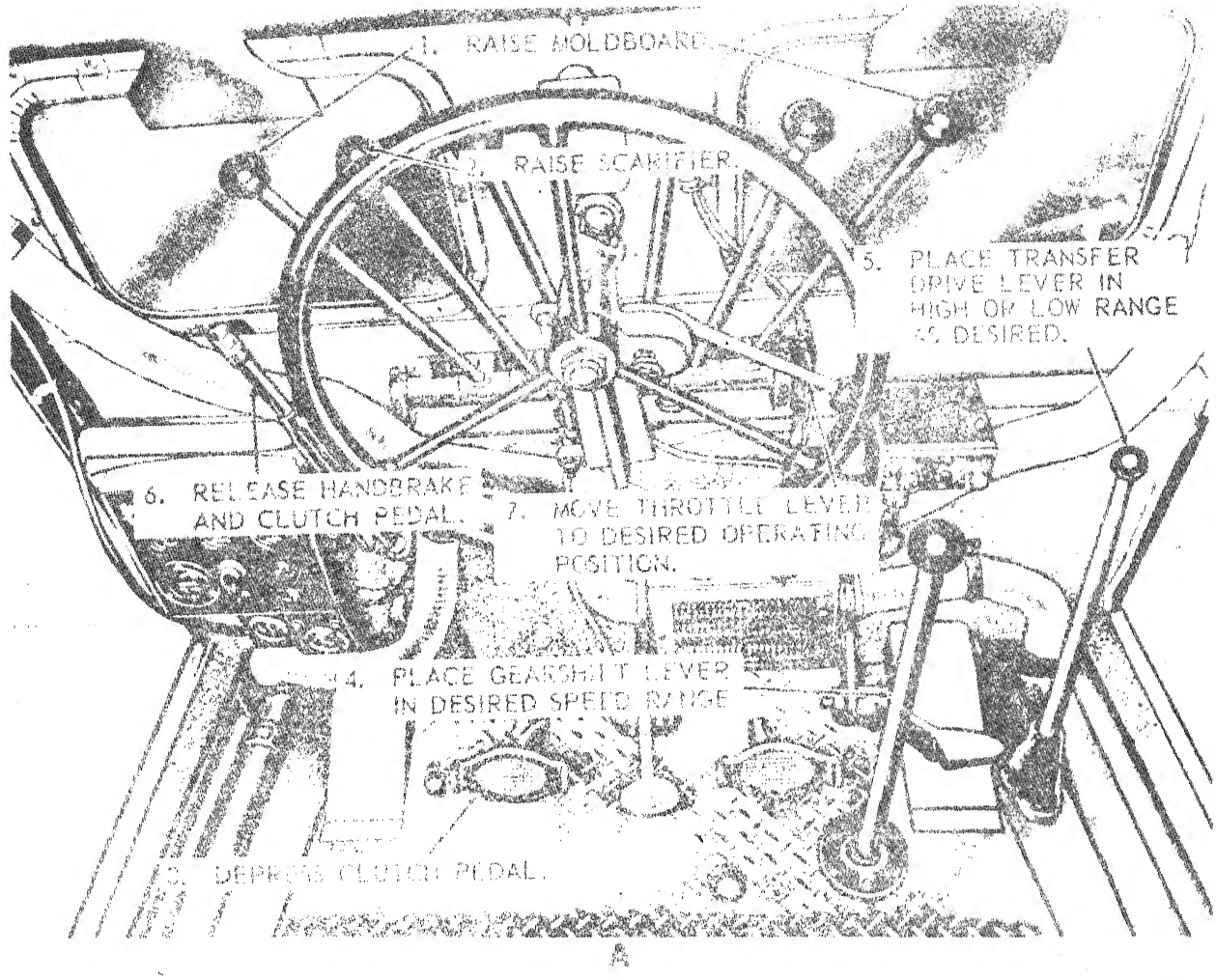
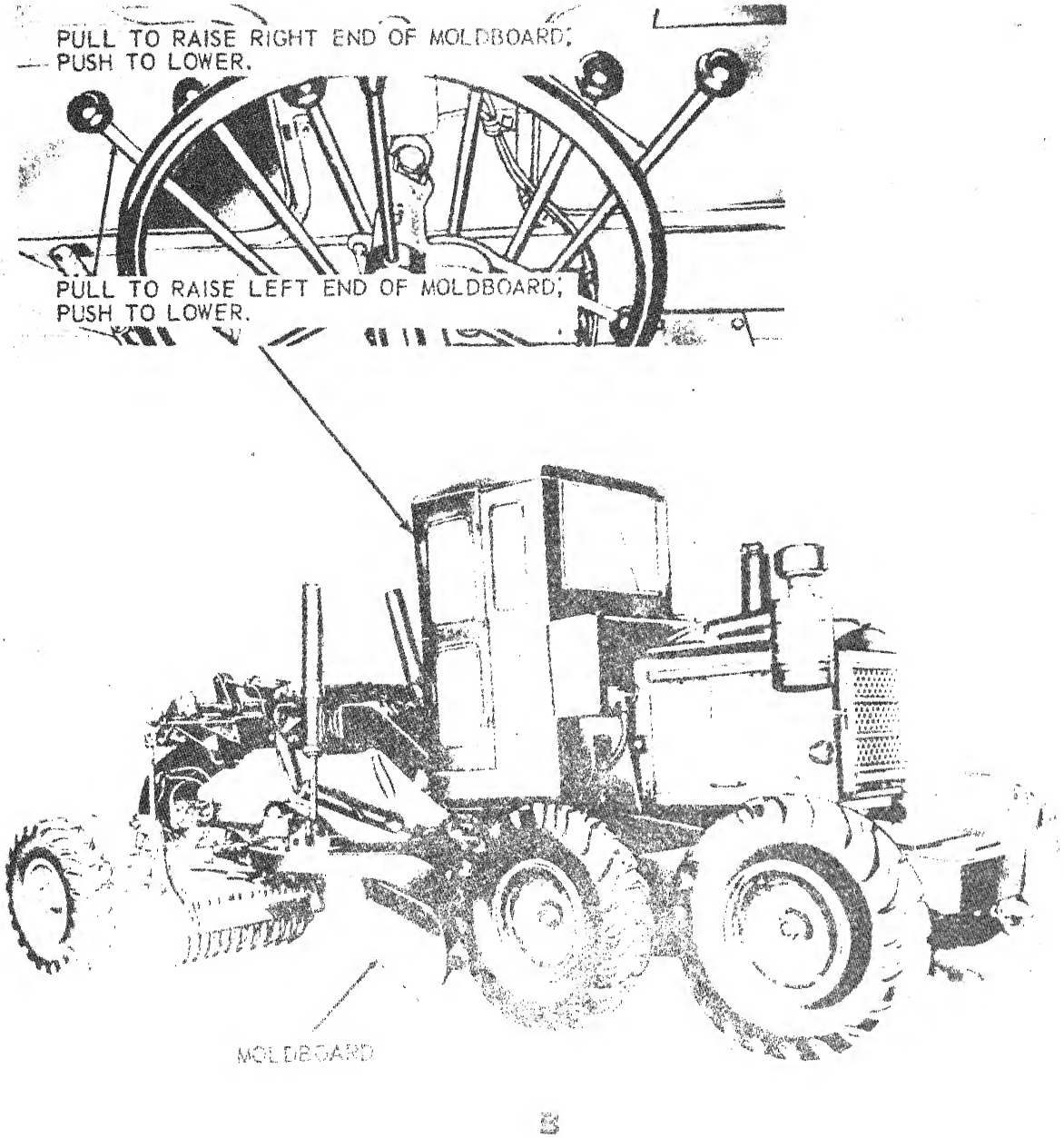


Figure 5. Stopping the road grader engine.



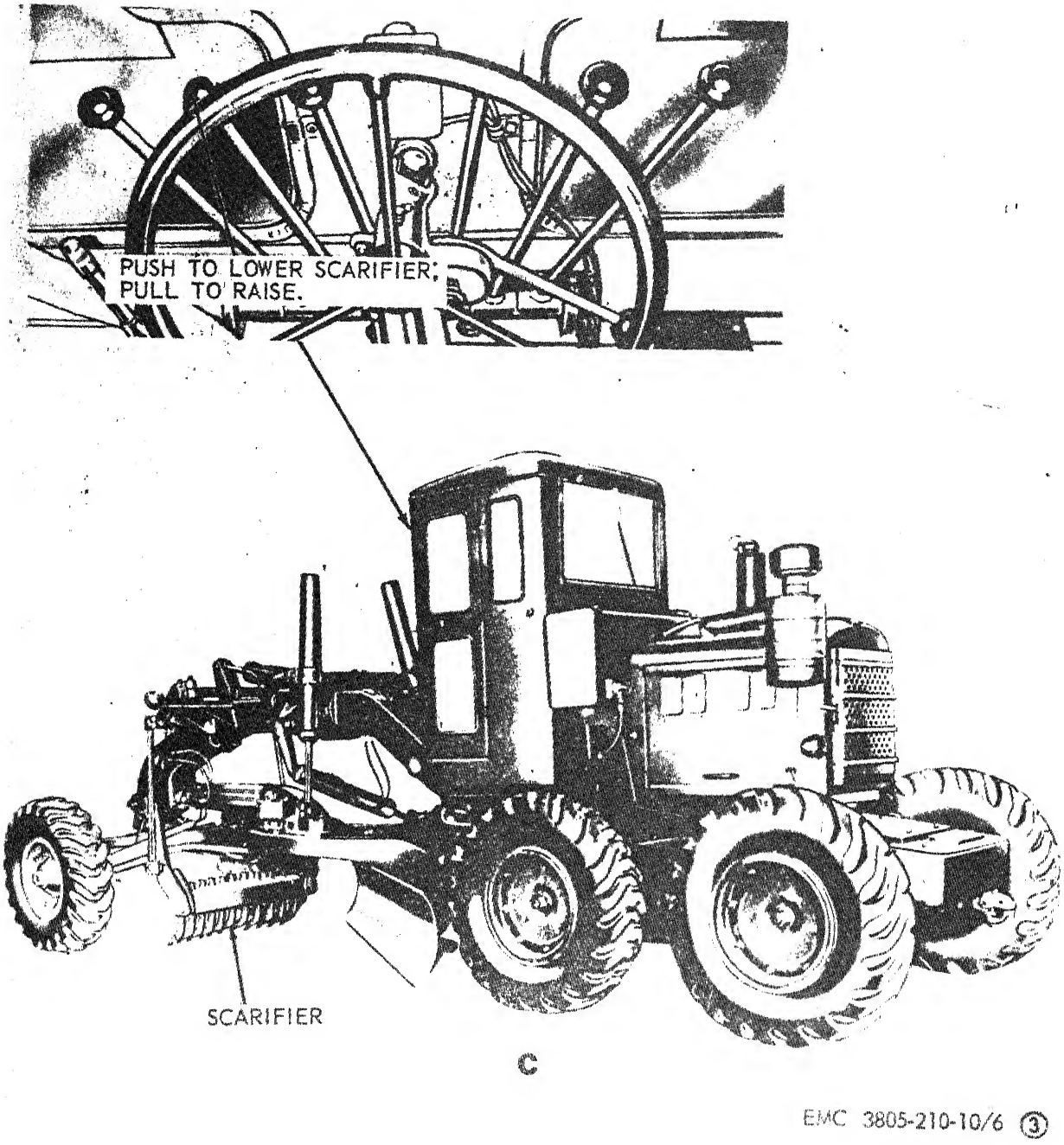
A—Putting grader in motion

Figure 6. Road grader operation.



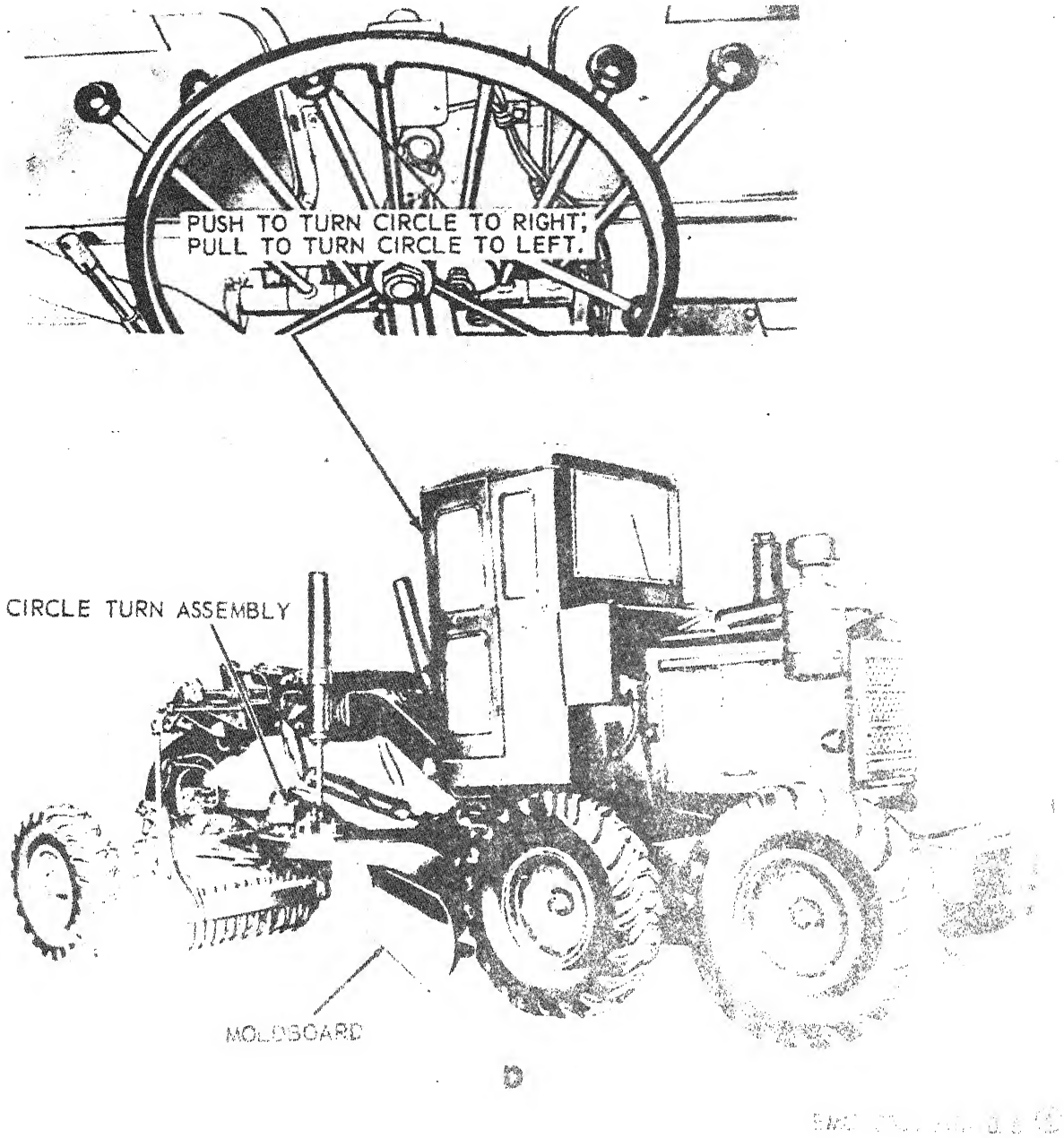
B—Moldboard operation

Figure 6—Continued.



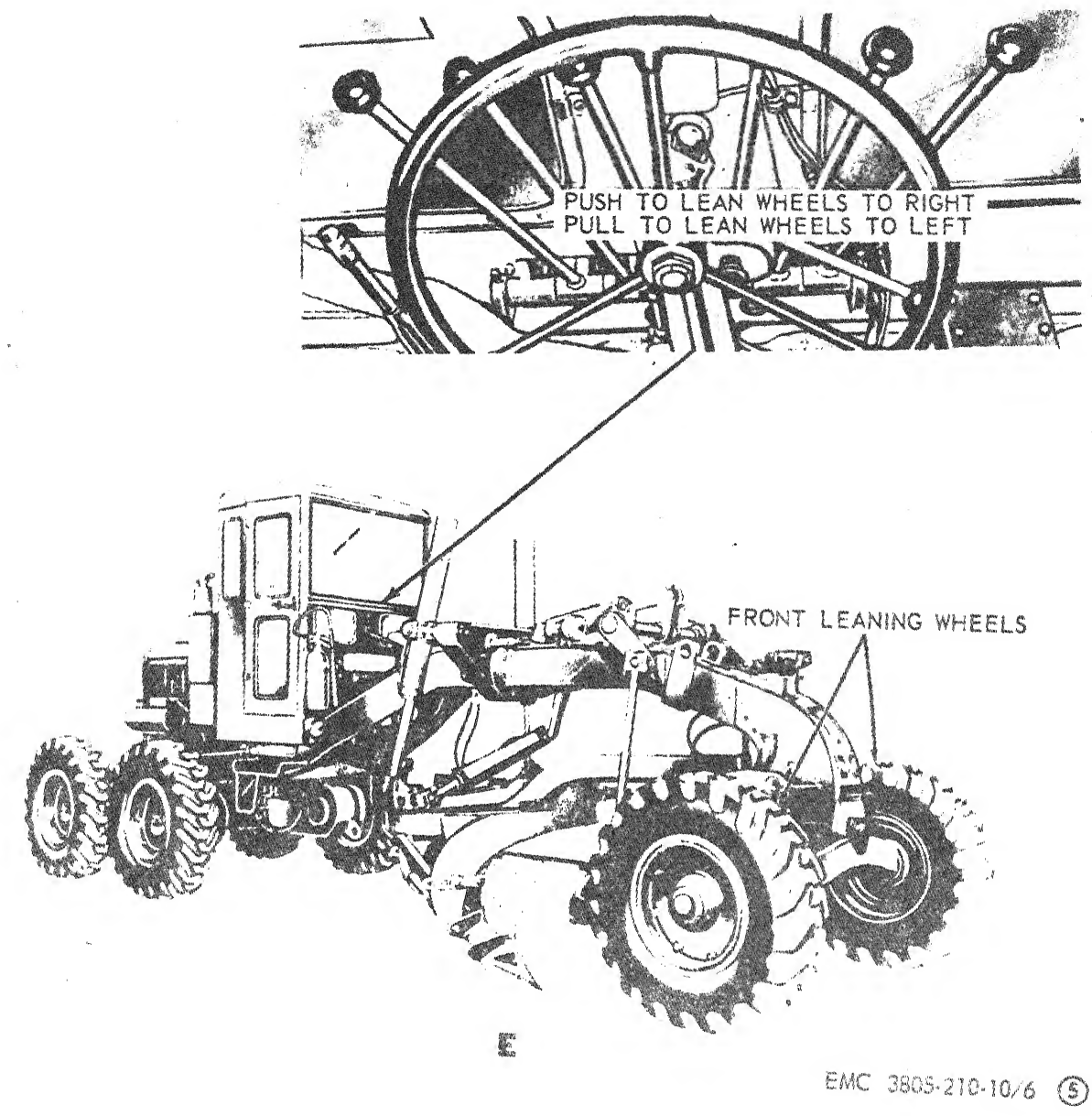
C—Scarifier operation

Figure 6—Continued.



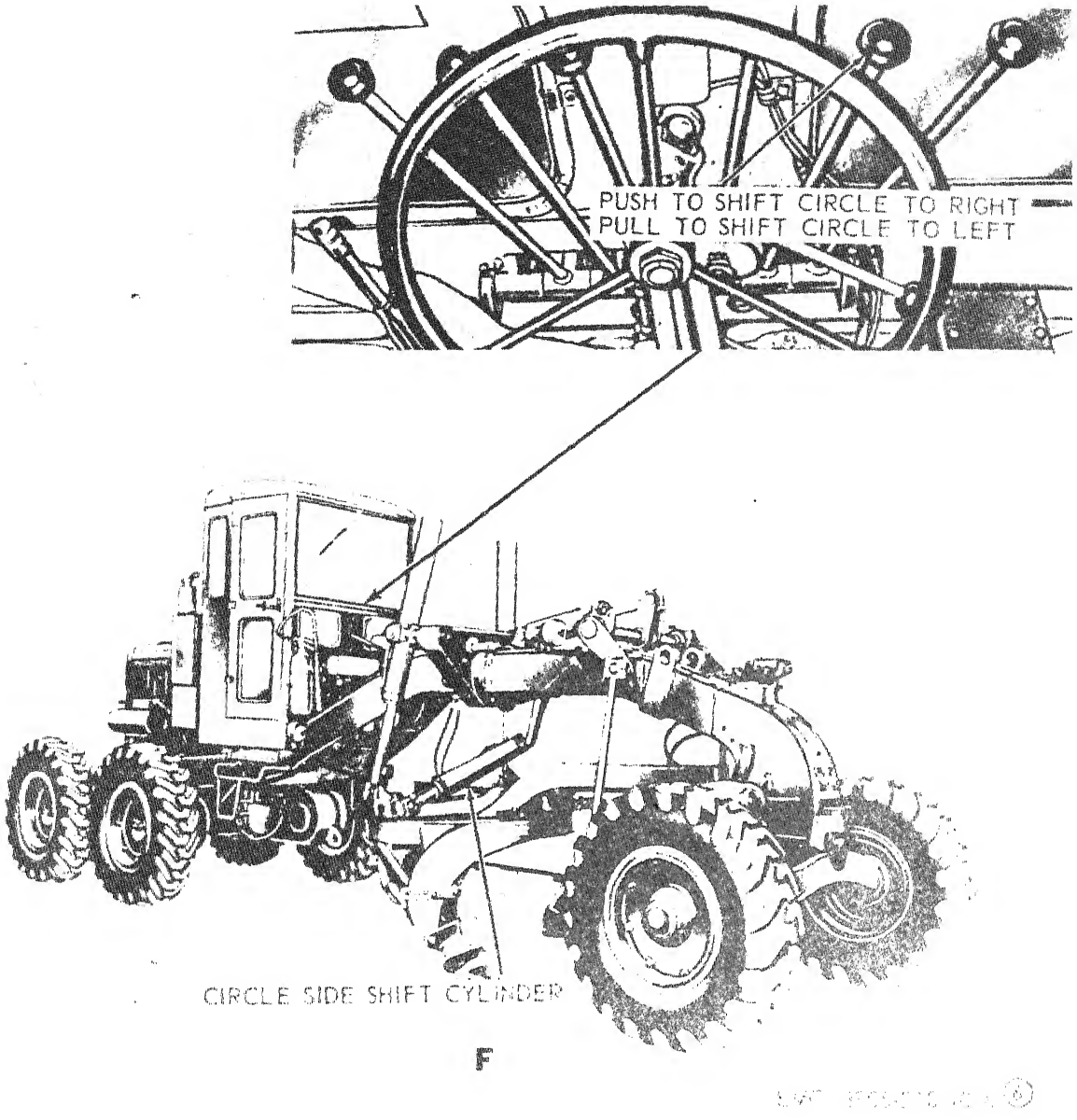
D—Circle turn operation

Figure 6—Continued.



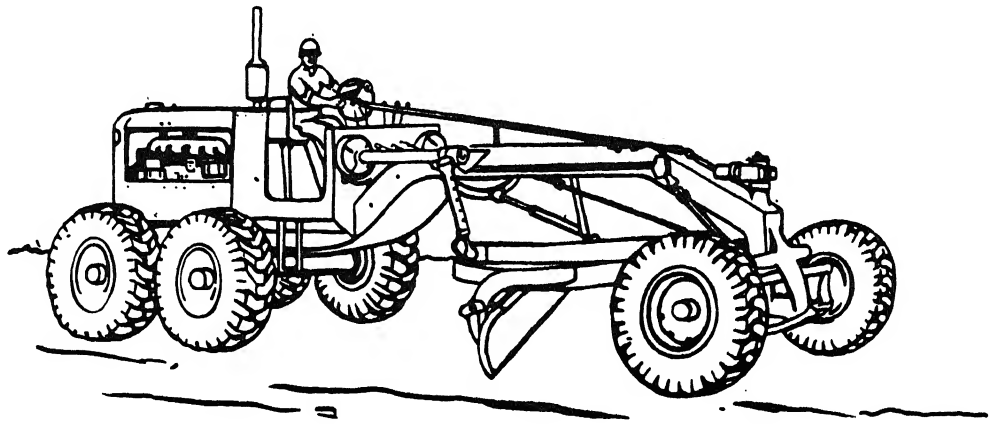
E—Front wheel leaning operation

Figure 6—Continued.

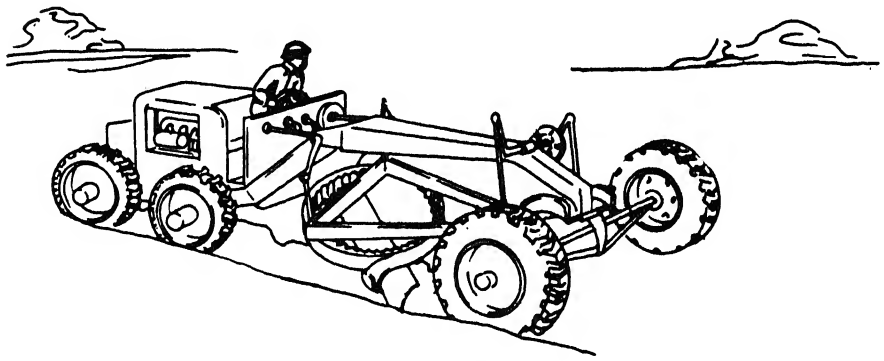


F—Circle side shift operation

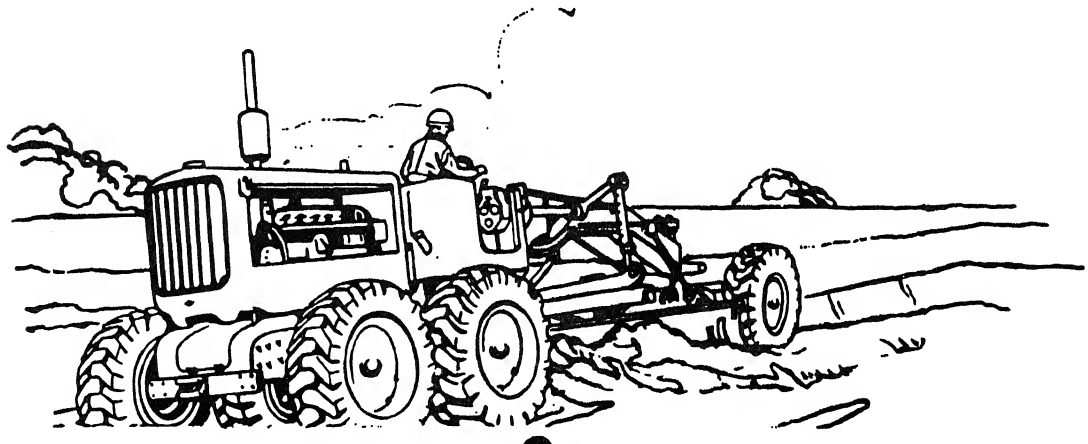
Figure 6—Continued.



A



B

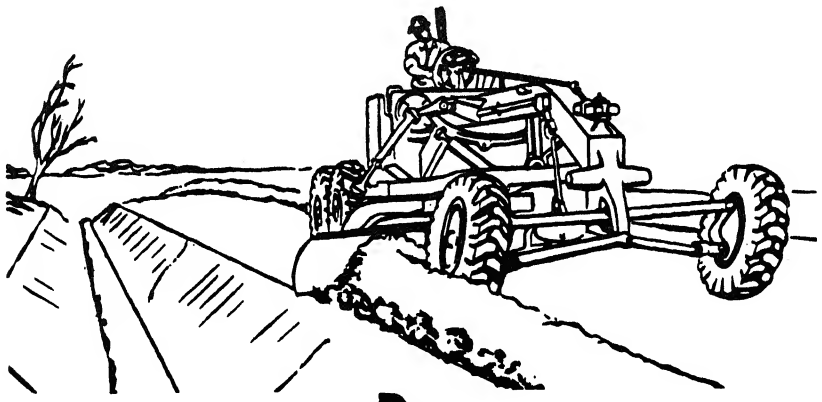


C

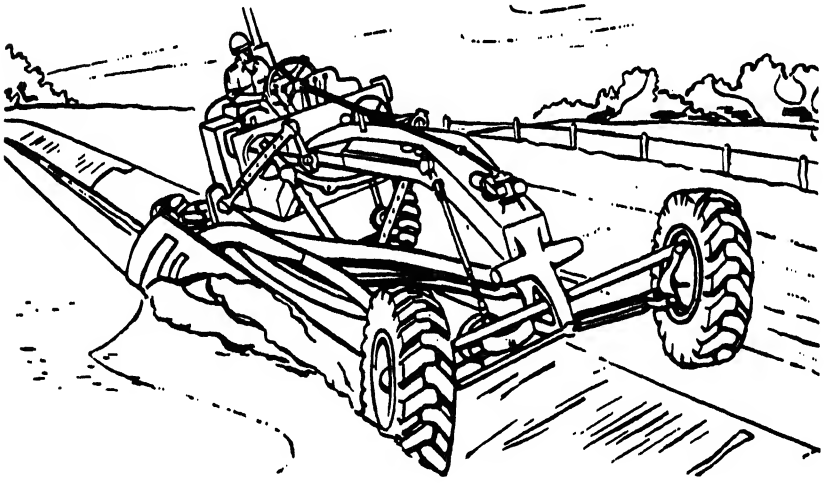
EMC 3805-210-10/7 (1)

A—Cutting action B—Starting the ditch C—Ditching in reverse

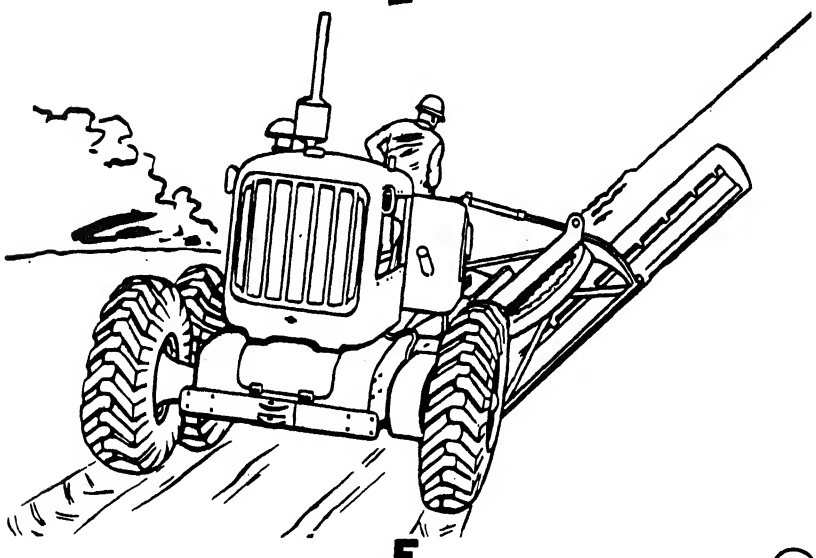
Figure 7. Earthworking operations.



D



E



F

EMC 3805-210-10/7 (2)

D—Moving the windrow E—Sloping low banks F—Sloping high banks

Figure 7—Continued.

access doors to allow unit to dry out before operating. Keep fuel tanks full to avoid condensation.

20. Operation in Salt-Water Areas

a. General. Wash the grader frequently with clean, fresh water. Do not contaminate fuel system or damage electrical system.

b. Protection. Coat exposed metal surfaces with rustproofing material. Remove rust immediately and apply paint and/or oil as applicable.

c. Cooling. Be sure water used in cooling system is free of salt and alkali.

Caution: **The cooling system is not intended for use with salt water; however, salt water may be used in an emergency.**

21. Operation at High Altitudes

a. The grader is designed to operate at elevations up to 5,000 feet above sea level without special service or adjustment.

b. Above 5,000 feet, the grader capacity will be reduced. This is a normal condition which cannot be prevented, but maximum performance can be maintained by following all service instructions carefully. Be sure air cleaners are clean and free of objects that might restrict the flow of air to the engine.

Note. Less air is drawn into the cylinders at high altitudes, which results in a richer fuel mixture, incomplete combustion, and a reduction of power. Horsepower decreases as altitude increases.

Section IV. OPERATION OF AUXILIARY MATERIEL USED IN CONJUNCTION WITH THE EQUIPMENT

22. Fire Extinguisher (Monobromotrifluoromethane Type)

a. Description. The monobromotrifluoromethane type fire extinguisher replaces the carbon dioxide and carbon tetrachloride type fire extinguishers used in the past. It is generally suitable for use on all types of fire, with exception of fires involving LOX (liquid oxygen) generating equipment. The fire extinguisher is furnished with a disposable type cylinder.

b. Operation. To operate the fire extinguisher, perform the following operations:

(1) Remove fire extinguisher from its location.
(2) Break the seal by pulling the safety pin from the handle.
(3) Point the horn at the base of the flame.
(4) Depress trigger for discharge and direct the stream of contents at the base of the fire.

Warning: **Avoid breathing of smoke.**

(5) Replace with new cylinder immediately after using.

c. Replacement of Cylinder. To replace with new cylinder, perform the following operations:

(1) Press lever to release pressure from old cylinder.
(2) Loosen swivel valve coupling nut and remove the valve assembly from used cylinder.
(3) Remove instruction band from used cylinder.
(4) Place new cylinder through the instruction band.
(5) Replace safety pin in valve and seal pin with seal wire.
(6) Attach valve assembly and tighten swivel coupling nut on the new cylinder; replace fire extinguisher in mounting bracket.
(7) Adjust instruction band on cylinder to show maintenance and operating instructions.

d. Maintenance. Weigh fire extinguisher every 6 months and replace cylinder if gross weight has decreased 4 ounces or more. Lubricate cylinder neck threads with one drop of OE 30 oil before reassembly.

23. Fire Extinguisher (Carbon Dioxide Type)

a. Description. The carbon dioxide fire extinguisher is suitable for use on electrical and flammable liquid fires. The carbon dioxide types are of 4-pound, 7–1/2 pound, and 10-pound sizes. The 4-pound extinguisher is portable; the other two are fixed on the equipment.

b. Operation. Remove the fire extinguisher, break the seal, operate the control valve, and direct the stream at the base of the flame.

c. Refilling and Maintenance. Refer to TM 9–1799 and TM 5–687 for refilling and maintenance instructions for the carbon dioxide fire extinguisher.

24. Slave Receptacle

a. Description. The slave receptacle is mounted on the left side of the engine housing below the fuel tank. The receptacle leads are connected to be battery side of the starter solenoid and ground. The receptacle is used as a connection to start the engine from an external power source when the grader batteries are discharged.

b. Operation. Operate the slave receptacle as instructed on figure 8.

25. Heaters

a. Description. The heater controls are located in the operator's cab. The space heater control box is mounted on the right side of the cab dash panel. The engine coolant and battery heater control boxes are mounted to the right of the operator's seat. The space heater heats the operator's cab and is thermostatically controlled by a thermostat assembly located on the cab dash panel. The operator can set the thermostat to any temperature between 50° and 100°F. The engine heater is used to warm the engine coolant, and the exhaust from the heater is used to heat the lubricating oil to aid in starting the engine in cold weather. The battery heater heats the battery compartment to provide peak battery output for starting the engine in cold weather.

b. Operation.

(1) Close the radiator shutters.

(2) Open the heater fuel shutoff valves.

(3) Operate the space, engine, and battery heater as instructed on figure 9.

Caution: **Never attempt to start the heaters while the lamp indicator is on.**

26. Ether Starting Aids

a. Description. Three ether starting aids are located in the operator's cab to the left of the

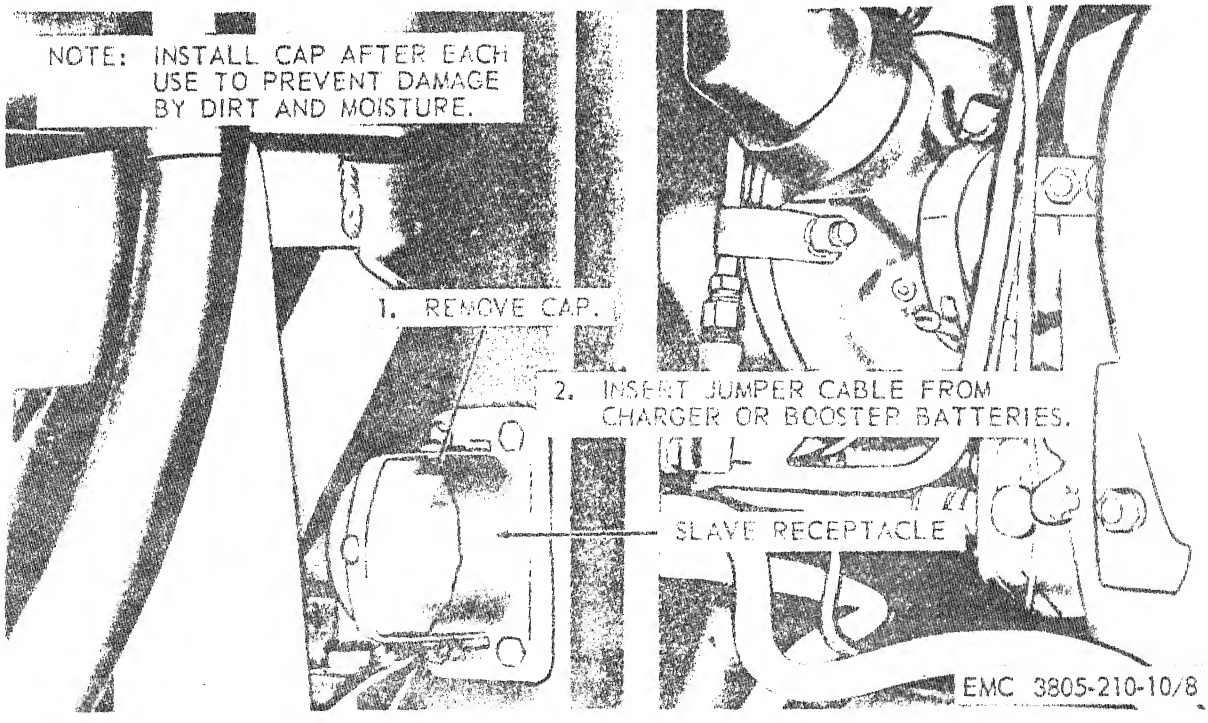
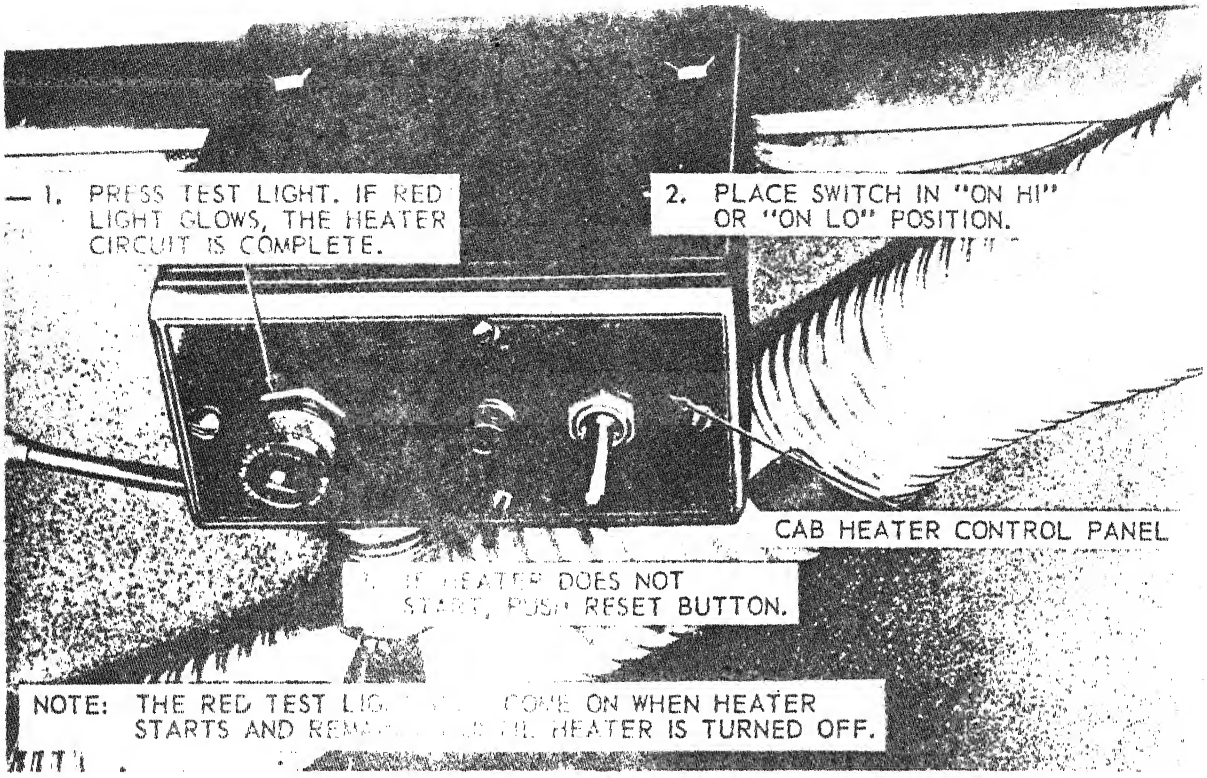
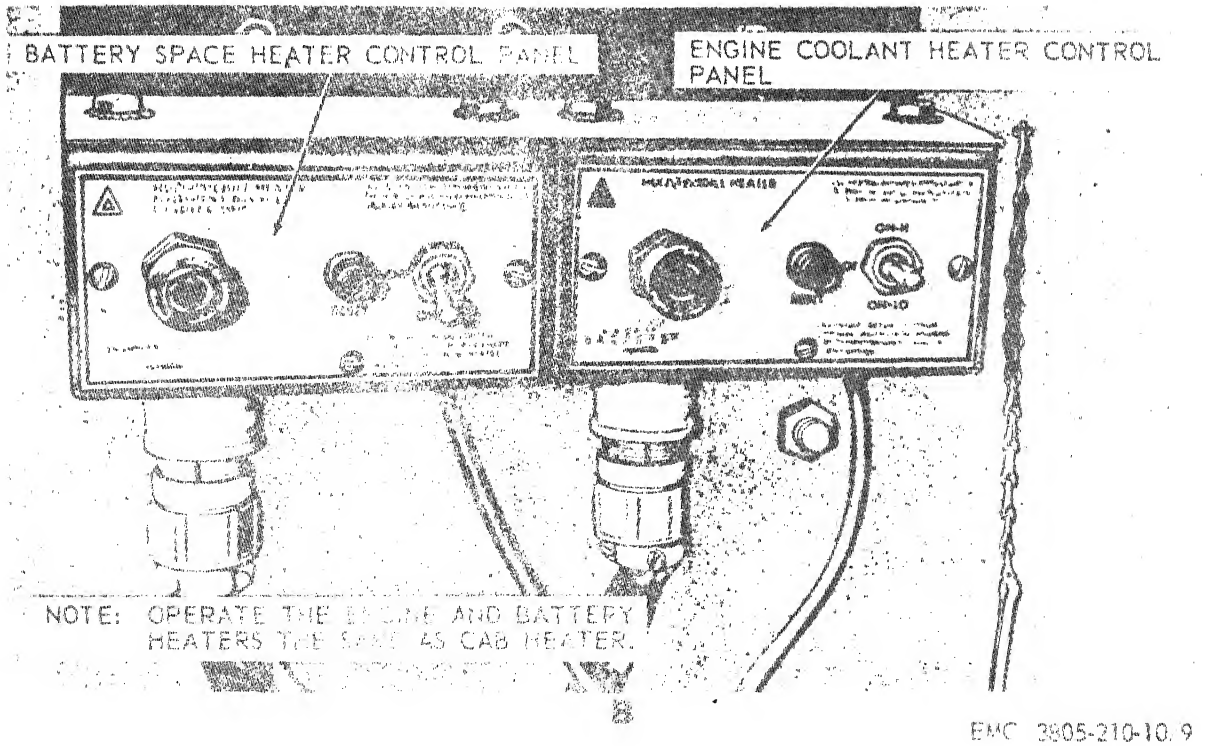


Figure 8. Slave receptacle operation.





A—Space heater control panel B—Battery and engine heater control panels

Figure 9. Space, engine, and battery heater operation.

operator's seat. Ether capsules are inserted in the starting aids to facilitate starting the engine. In temperatures above 0°F., the engine can normally be started with one starting aid. In temperatures of 0°F. to –65°F., it may be necessary to use all three starting aids simultaneously.

b. Operation. Operate the ether starting aids as instructed on figure 10.

27. Trouble Light

The trouble light is located in the toolbox under the right side of the operator's seat. When its use is required, remove the light from the toolbox and the shield from the trouble light socket (A fig. 3). Push the connector end of the light cord into the socket and turn clockwise until locked in position.

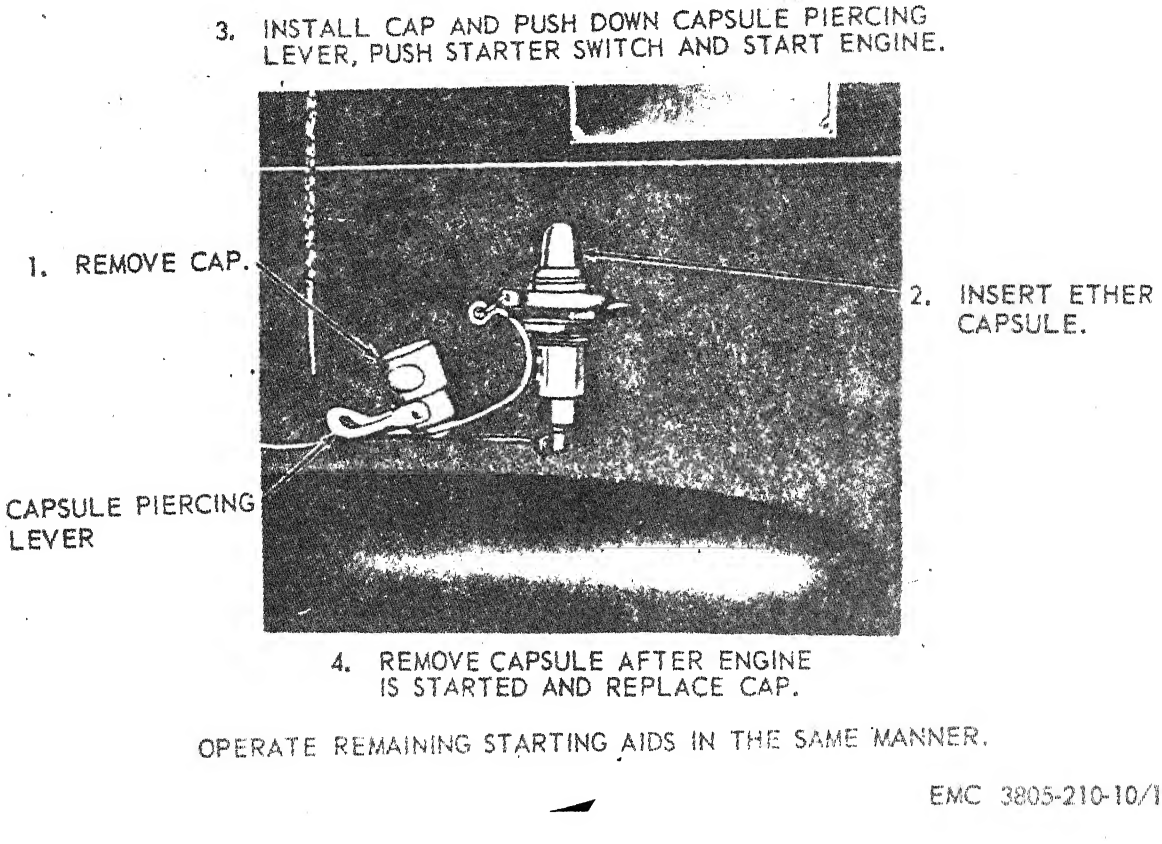


Figure 10. Ether starting aid operation.

CHAPTER 3
MAINTENANCE INSTRUCTIONS

Section I. OPERATOR'S TOOLS AND EQUIPMENT

28. Special Tools and Equipment

No special tools or equipment is needed by the operator for the maintenance of this road grader.

29. Basic Issue Tools and Equipment

Tools and repair parts issued with or authorized for the road grader are listed in appendix II.

Section II. LUBRICATION

30. General Lubrication Information

a. This section contains lubrication instructions which are supplemental to, and not specifically covered in, the lubrication order (fig. 11).

b. The lubrication order shown in figure 11 is an exact reproduction of the approved lubrication order for the road grader. For current lubrication order, refer to DA Pam 310–4.

31. Detailed Lubrication Information

a. Care of Lubricants and Lubricating Equipment. Keep all lubricants in closed containers and stored in a clean, dry area away from heat. Do not allow dirt, dust, water, or other foreign material to come in contact with lubricants. Keep lubricating equipment clean and filled for immediate use.

b. Cleaning.

(1) Wipe grease fittings with a clean, dry cloth before lubricating. Remove oil or hardened lubricants from fittings with an approved cleaning solvent.

(2) Keep areas around drains, filler caps, and plugs clean. Remove caps or plugs only when checking levels or adding lubricants.

(3) After lubrication, wipe excess lubricant from fittings.

c. Lubrication.

(1) Lubricate in the proper quantity. Refer to the current lubrication order for capacities.

(2) Apply grease to fittings until it is visible from the part being lubricated unless otherwise specified. Use caution when lubricating parts containing seals; excessive pressure may ruin seals.

d. Points of Application. Points requiring lubrication are illustrated as reference views on figure 11.

e. OES Oil.

(1) The crankcase oil level must be checked frequently as oil consumption may increase.

(2) The oil may require changing frequently because contamination by dilution and sludge formation will increase during cold-weather operation.

f. Primary and Secondary Oil Filter Service. Service the primary and secondary filters as instructed on figure 12.

g. Transmission Breather Service. Service the transmission breather as instructed on figure 13.

h. Air Cleaner and Precleaner Service. Service the air cleaner and precleaner as instructed on figure 14.

LUBRICATION ORDER
LC 36C9-2-16-1

LO 5-3805-210-20-1

7 MAY 1962 Supersedes LO 5-3805-210-20-1/LC 36C9-2-16-1, 21 October 1960)

GRADER, ROAD, MOTORIZED: DIESEL DRIVEN; 12,100 TO 14,300 LB PRESSURE AT BLADE; (HUBER-WARCO MODEL 4D) W/GMC DIESEL ENGINE MODEL 4025

Reference: LO 5-3805-210-20-2. SM 10-1-C4-1

Intervals are based on normal hours of operation. Reduce to compensate for abnormal operations and severe conditions. During inactive periods, sufficient lubrication must be performed for adequate preservation.

Clean fittings before lubricating.

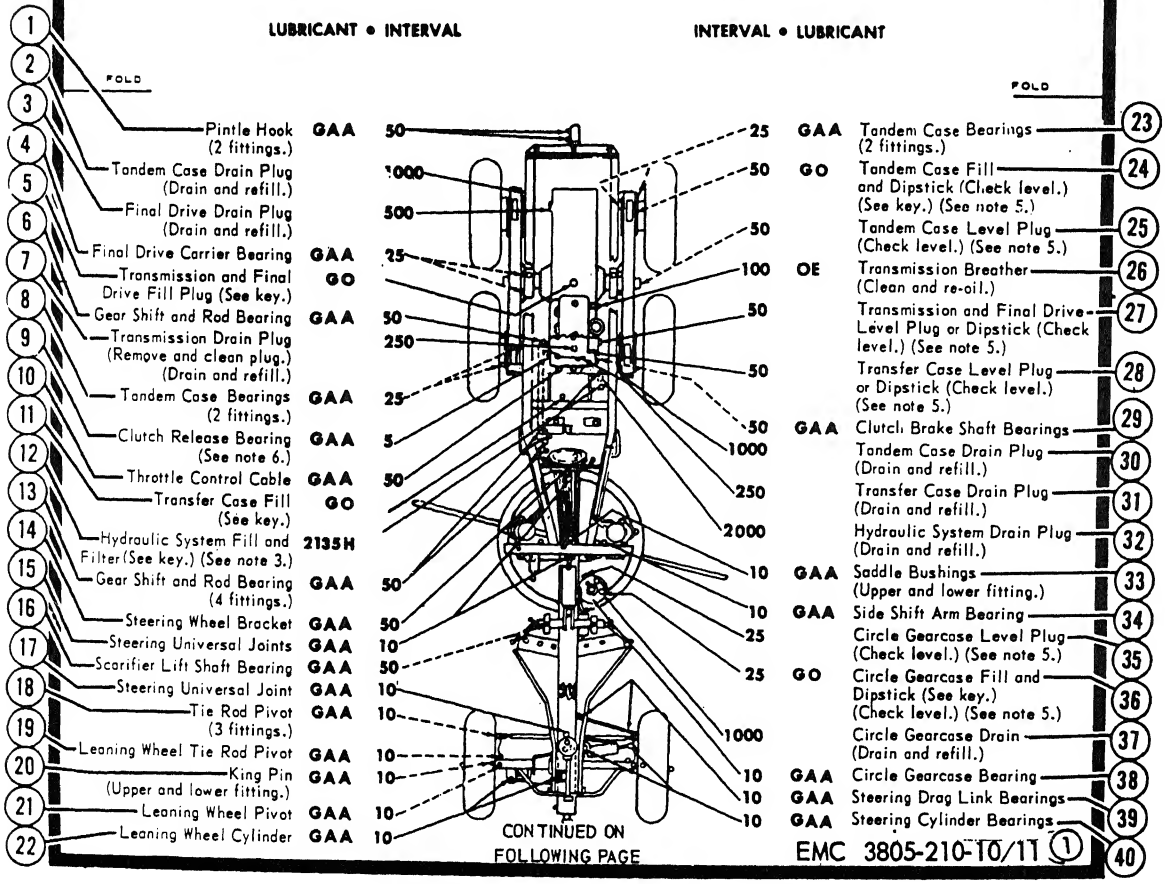
Relubricate after washing or fording.

A dotted circle indicates a drain below.

Clean parts with SOLVENT, dry-cleaning, or with OIL, fuel, Diesel. Dry before lubricating.

Lubricate points indicated by dotted arrow shafts on both sides of equipment.

Drain gearcases when hot. Fill and check level.



Front

Figure 11. Lubrication order.

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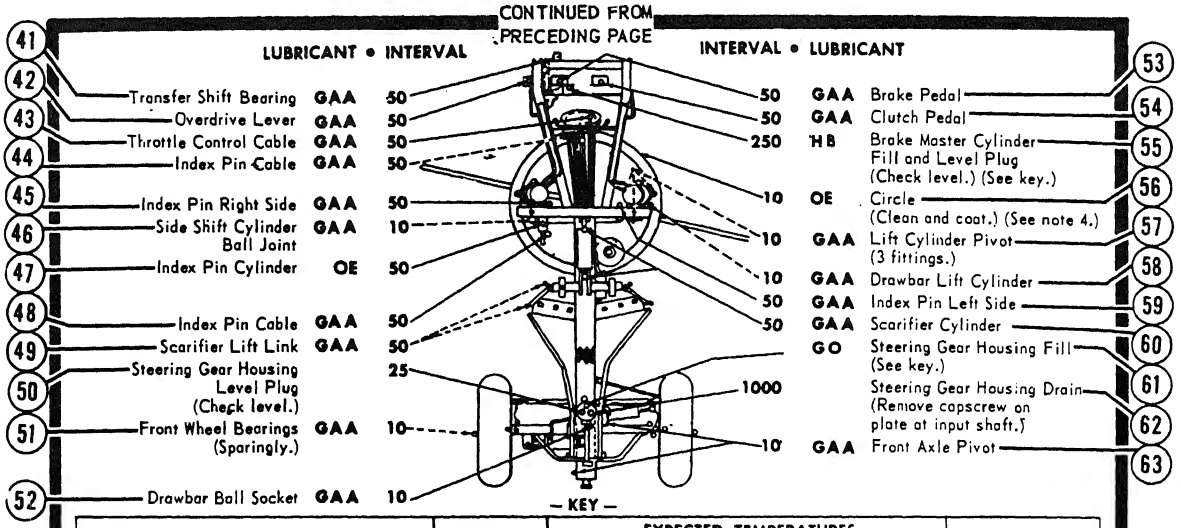


– KEY –

LUBRICANTS	CAPACITY	EXPECTED TEMPERATURES			INTERVALS
		Above +32°F	+40°F to -10°F	0°F to -65°F	
GO-LUBRICANT, Gear Universal					
Transmission and Final Drive	48 qt	GO 140	GO 90	GOS	Intervals given are in hours of normal operation.
Transfer Drive	6 qt				
Tandem Case	28 qt ea	GO 90			
Circle Gearcase	3 qt	GO 140			
Steering Gear Housing	1 qt				
GOS-LUBRICANT, Gear Universal, Sub-zero					

FOLD FOLD

2135-H-LUBRICATING OIL, Hydraulic		2135-H	2110-H	2075-H
Hydraulic System	120 qt			
HB-HYDRAULIC Fluid, Non-petroleum		All Temperatures		
Brake Master Cylinder	½ qt			
OE-OIL, Engine, Heavy Duty				
Oil Can Points.				
GAA-GREASE, Automotive and Artillery				

NOTES:

1. FOR OPERATION OF EQUIPMENT IN PROTRACTED COLD TEMPERATURES BELOW -10°F. Remove lubricants prescribed in the key for temperatures above -10°F. Clean parts with SOLVENT, dry-cleaning. Relubricate with lubricants specified in the key for temperatures below -10°F.

2. OIL CAN POINTS. Every 50 hours lubricate all controls, levers, linkage, stop cable, and all exposed adjusting threads with OE.

3. HYDRAULIC SYSTEM. Every 10 hours clean filter by turning handle one complete turn with engine operating. Every 2000 hours drain system by removing hose connections or drain plug at bottom of tank. Remove filter from tank, clean element and sump. Install filter and hose connections or drain plug. Fill system, operate engine and controls 5 minutes, check level, and bring to 3 inches from top of tank.

4. GRADER CIRCLE. Do not lubricate turn pinion teeth or gear teeth of circle.

5. GEARCASE OIL LEVEL. Dipstick used on units after serial number MD810, level plugs before.

6. CLUTCH RELEASE BEARING. Every 5 hours lubricate clutch release bearing if excessive clutching is necessary in grader operation. Force approximately ¼ oz lubricant into bearing while rotating. CAUTION: Be sure transmission is in neutral. Rotate bearing by depressing clutch pedal to eliminate free travel with engine running. Do not over lubricate. NOTE: Every 250 hours remove transmission adapter housing cover, inspect hose, and remove excessive lubricant.

BY ORDER OF THE SECRETARIES OF THE ARMY AND THE AIR FORCE:

G. H. DECKER,
General, United States Army,
Chief of Staff.

OFFICIAL:
J. C. LAMBERT,
Major General, United States Army,
The Adjutant General.

THOMAS D. WHITE,
Chief of Staff,
United States Air Force.

OFFICIAL:
J. L. TARR,
Colonel, United States Air Force,
Director of Administrative Services.

EMC 3805-210-10/11
EMC 5-3805-210-10/1 (2)

Back

Figure 11—Continued.

LUBRICATION ORDER
LC 36C9-2-16-2

LO 5-3805-210-20-2

16 FEBRUARY 1960

GRADER, ROAD, MOTORIZED; DIESEL DRIVEN; 12,100 TO 14,300 LB PRESSURE AT BLADE: 12 FT BLADE (HUBER-WARCO MODEL 4D) W/GMC DIESEL ENGINE MODEL 4025

Reference: LO 5-3805-210-20-1, SM 10-1-C4-1

Intervals are based on normal hours of operations. Reduce to compensate for abnormal operations and severe conditions. During inactive periods sufficient lubrication must be performed for adequate preservation.

Clean fittings before lubricating.

Relubricate after washing or fording.

A dotted circle indicates a drain below.

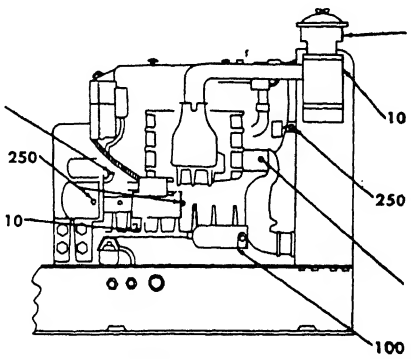
Clean parts with SOLVENT, dry-cleaning, or with OIL, fuel, Diesel. Dry before lubricating.

Drain crankcase only when hot after operation; replenish and check level when cool.

FOLD

FOLD

LUBRICANT	INTERVAL	
64 Crankcase Fill (See key)	OE	
65 Starter Bearings (Remove plugs, lubricate sparingly, install plugs)	OE	250
66 Crankcase Oil Level Gage (Check level)		10



ENGINE (LEFT SIDE)

INTERVAL	LUBRICANT	
		67 Precleaner and Sight Glass (Remove cleaner when dirt collects at sight glass. Wash, dry and install)
10	OE	68 Air Cleaner (Check level. Every 50 operating hours disassemble, clean, and re-oil) (See key)
250	GAA	69 Fan Hub Bearing (Remove plug, install fitting, lubricate, remove fitting and re-install plug)
		Water Pump (Prepacked bearings no lubrication required)
100		70 Engine Oil Filter (See note 3)

CONTINUED ON FOLLOWING PAGE

Front (Engine, left side)

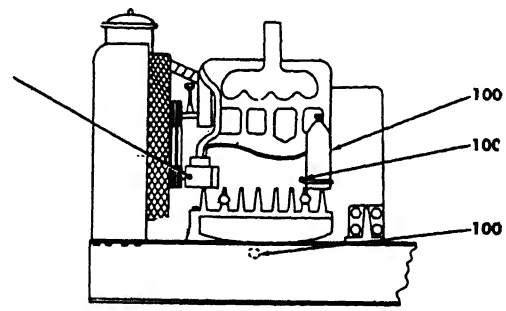
Figure 11—Continued.

CONTINUED FROM PRECEDING PAGE

LUBRICANT • INTERVAL

INTERVAL • LUBRICANT

Generator Bearings (Sealed bearings, no lubrication required)



Engine Oil Filter (See note 3) — 71

Engine Oil Filter Drain Plug (Drain and refill through crankcase) — 72

Crankcase Drain Plug (Drain and refill) — 73

ENGINE (RIGHT SIDE)

-KEY-

LUBRICANTS	CAPACITY	EXPECTED TEMPERATURE			INTERVALS
		Above +32°F	+40°F to -10°F	0°F to -65°F	
OE-OIL, Engine, Heavy Duty					
Air Cleaner	4½ qts.	OE 30 or 9250	OE 10 or 9110	OES	"Intervals given are in hours of normal operation"
Crankcase	18 qts.				
OES-OIL, Engine, Sub-zero					
GAA-GREASE, Automotive and Artillery		All Temperatures			

FOLD FOLD

NOTES:

1. FOR OPERATION OF EQUIPMENT IN PROTRACTED COLD TEMPERATURES BELOW -10°F. Remove lubricants prescribed in the key for temperatures above -10°F. Clean parts with SOLVENT, dry-cleaning. Relubricate with lubricants specified in the key for temperatures below -10°F.

2. OIL CAN POINTS. Every 50 service hours, lubricate governor and throttle control linkage, clevis and pivot points with OE.

3. ENGINE OIL FILTERS. Every 100 service hours, or at crankcase oil change, remove filter element, clean filter housing and install new filter element. Fill crankcase, operate engine 5 minutes, check housing and lines for leaks. Check crankcase level and bring to full mark.

Copy of this Lubrication Order will remain with equipment at all times; instructions contained herein are mandatory.

BY ORDER OF THE SECRETARIES OF THE ARMY AND THE AIR FORCE:

OFFICIAL:

B. V. LEE,
Major General, United States Army,
The Adjutant General.

L. L. LEMNITZER,
General, United States Army,
Chief of Staff.

OFFICIAL:

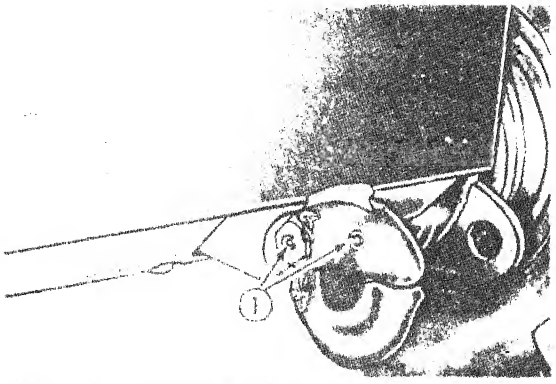
J. L. TARR,
Colonel, United States Air Force,
Director of Administrative Services.

THOMAS D. WHITE,
Chief of Staff,
United States Air Force.

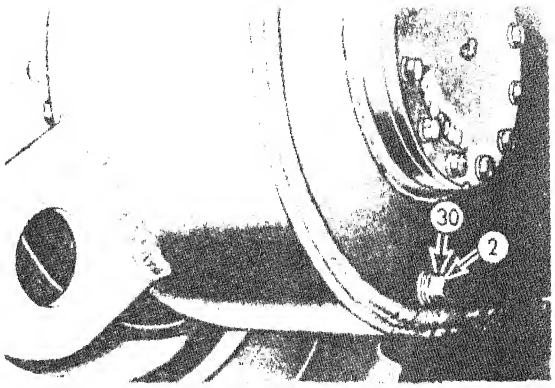
EMC 3805-210-10/11 (4)

Rear (Engine, right side)

Figure 11—Continued.

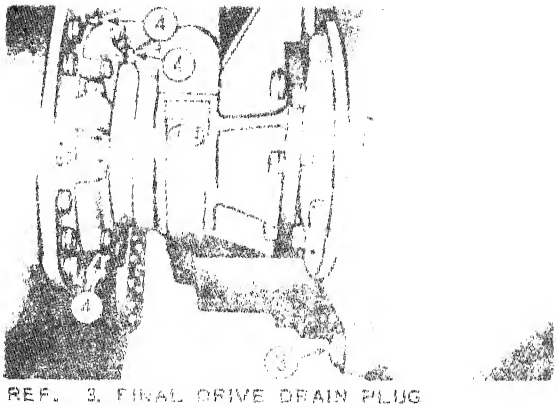


REF. 1. PINTLE HOOK



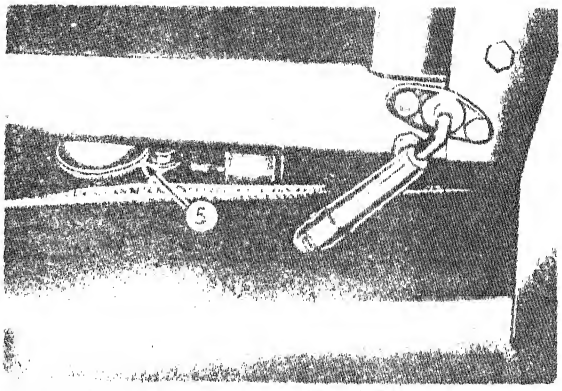
REF. 2. TANDEM CASE DRAIN PLUG

REF. 30. TANDEM CASE DRAIN PLUG

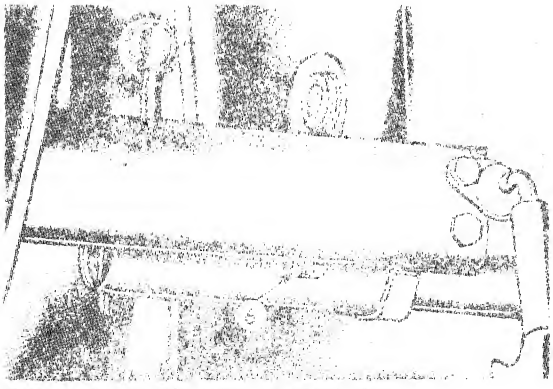


REF. 3. FINAL DRIVE DRAIN PLUG

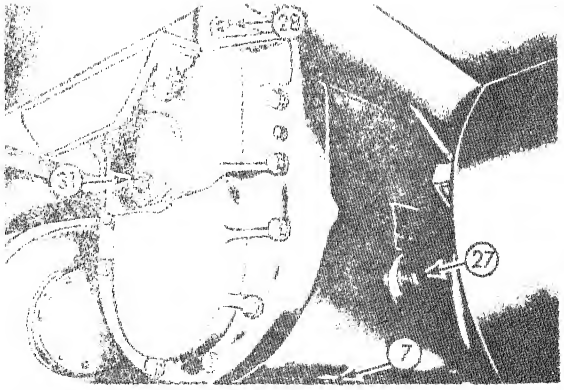
REF. 4. FINAL DRIVE CARRIER BEARING



REF. 5. TRANSMISSION AND FINAL DRIVE FILL PLUG



REF. 6. GEAR SHIFT AND ROD BEARING

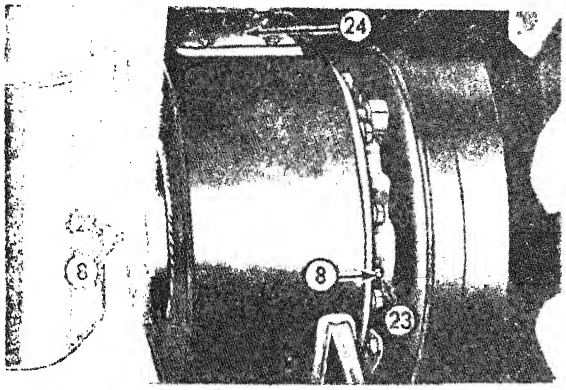


REF. 7. TRANSMISSION DRAIN PLUG
REF. 27. TRANSMISSION AND FINAL DRIVE LEVEL PLUG OR DIPSTICK
REF. 28. TRANSFER CASE LEVEL PLUG
REF. 31. TRANSFER CASE DRAIN PLUG

EMC 3805-210-10/11 (5)

References 1 through 7, 27, 28, 30, and 31

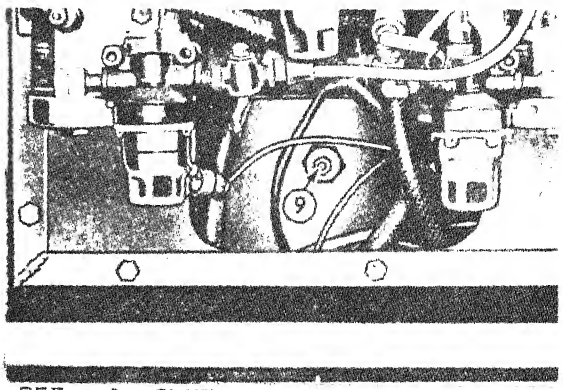
Figure 11—Continued.



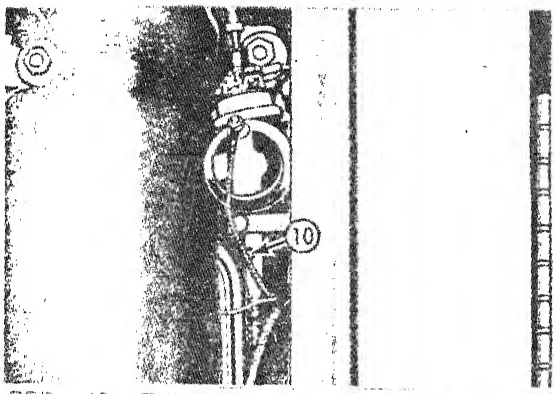
REF. 8. TANDEM CASE BEARINGS

REF. 23. TANDEM CASE BEARINGS

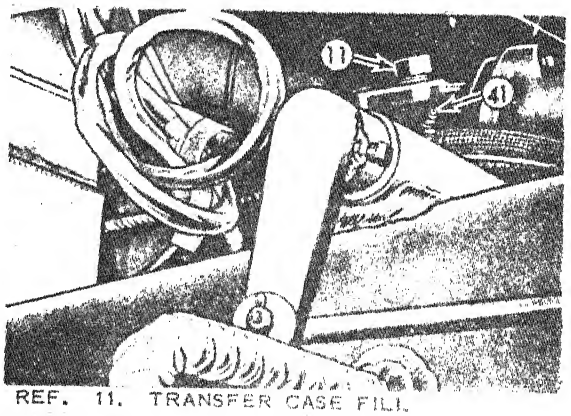
REF. 24. TANDEM CASE FILL AND DIPSTICK



REF. 9. CLUTCH RELEASE BEARING

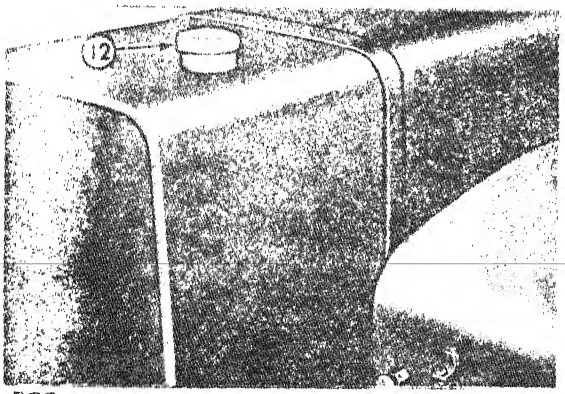


REF. 10. THROTTLE CONTROL CABLE

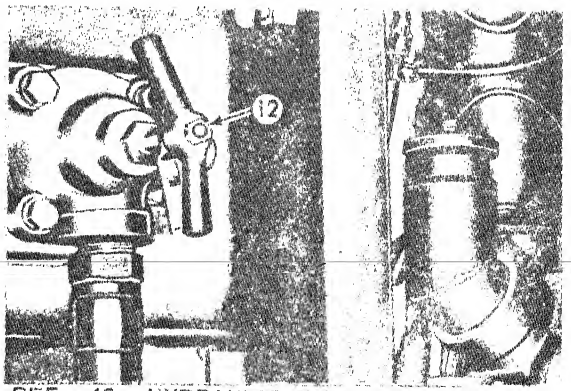


REF. 11. TRANSFER CASE FILL

REF. 41. TRANSFER SHIFT BEARING



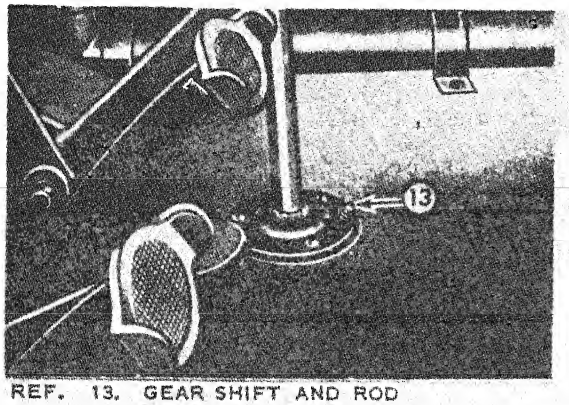
REF. 12. HYDRAULIC SYSTEM FILL AND FILTER



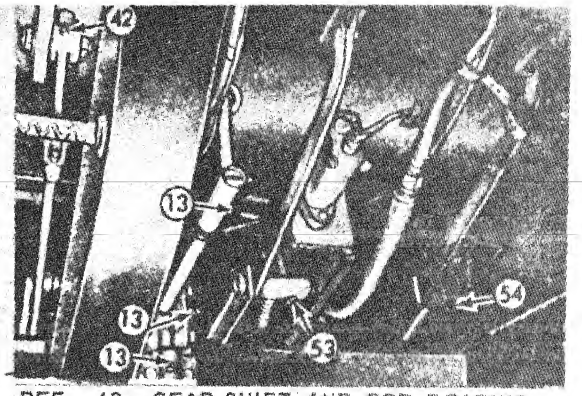
REF. 12. HYDRAULIC SYSTEM FILL AND FILTER

References 8 through 12, 23, 24, and 41

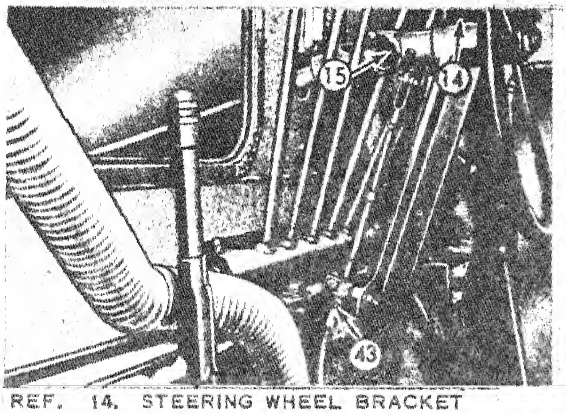
Figure 11—Continued.



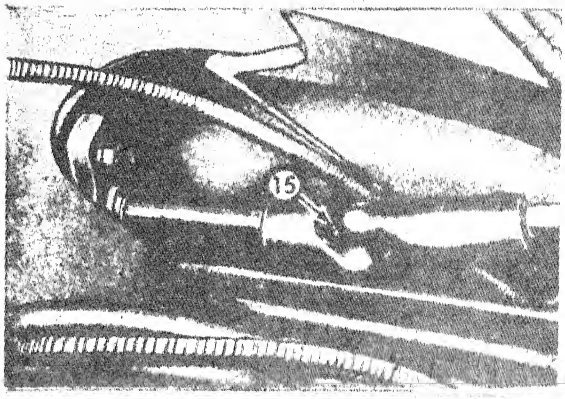
REF. 13. GEAR SHIFT AND ROD BEARING



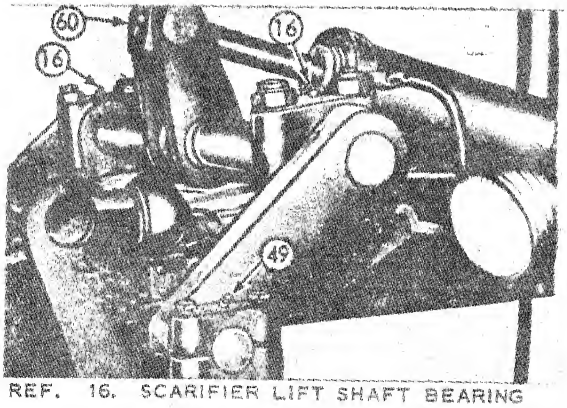
REF. 13. GEAR SHIFT AND ROD BEARING
REF. 42. OVERDRIVE LEVER
REF. 53. BRAKE PEDAL
REF. 54. CLUTCH PEDAL



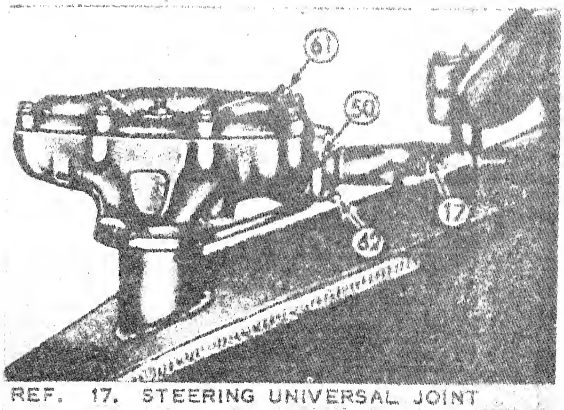
REF. 14. STEERING WHEEL BRACKET
REF. 15. STEERING UNIVERSAL JOINTS
REF. 43. THROTTLE CONTROL CABLE



REF. 15. STEERING UNIVERSAL JOINTS



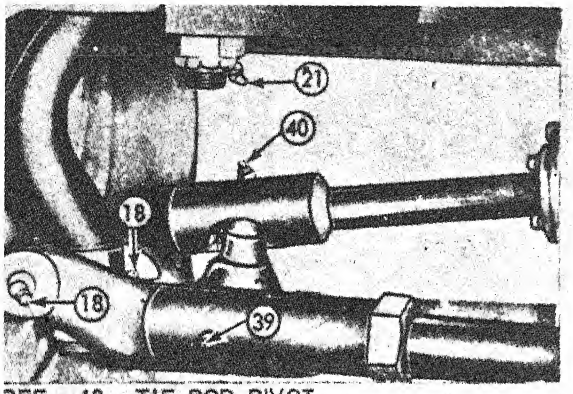
REF. 16. SCARIFIER LIFT SHAFT BEARING
REF. 49. SCARIFIER LIFT LINK
REF. 60. SCARIFIER CYLINDER



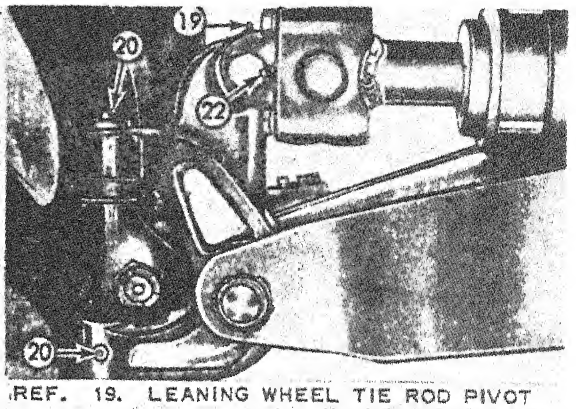
REF. 17. STEERING UNIVERSAL JOINT
REF. 50. STEERING GEAR HOUSING LEVEL PLUG
REF. 61. STEERING GEAR HOUSING FILL
REF. 62. STEERING GEAR HOUSING DRAIN

EMC 3805-210-10/11 (7)

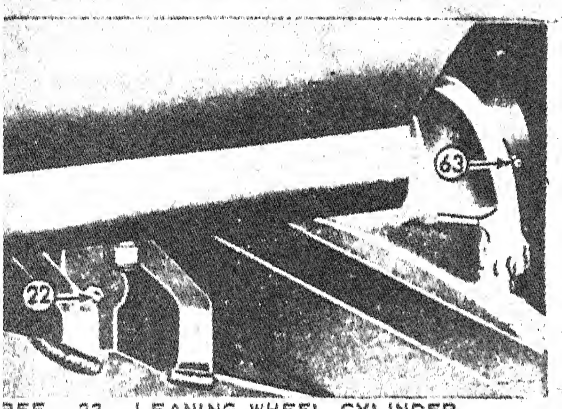
References 13 through 17, 42, 43, 49, 50, 53, 54, and 60 through 62
Figure 11—Continued.



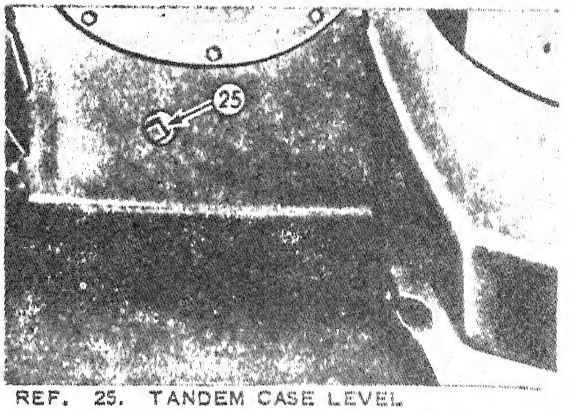
REF. 18. TIE ROD PIVOT
REF. 21. LEANING WHEEL PIVOT
REF. 39. STEERING DRAG LINK BEARINGS
REF. 40. STEERING CYLINDER BEARINGS



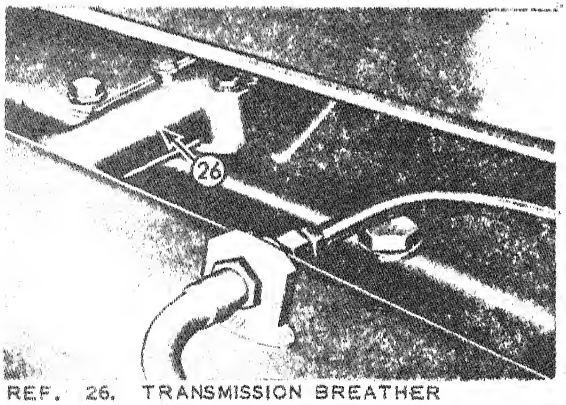
REF. 19. LEANING WHEEL TIE ROD PIVOT
REF. 20. KING PIN
REF. 22. LEANING WHEEL CYLINDER



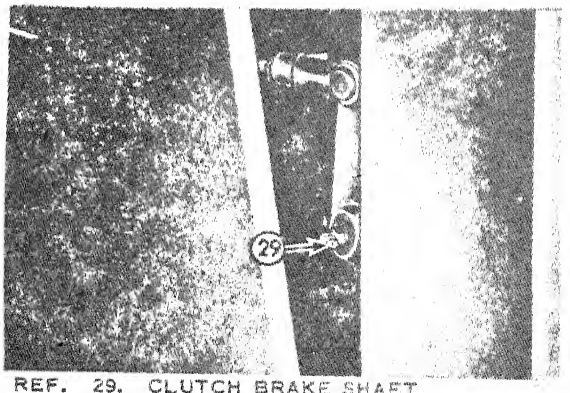
REF. 22. LEANING WHEEL CYLINDER
REF. 63. FRONT AXLE PIVOT



REF. 25. TANDEM CASE LEVEL PLUG



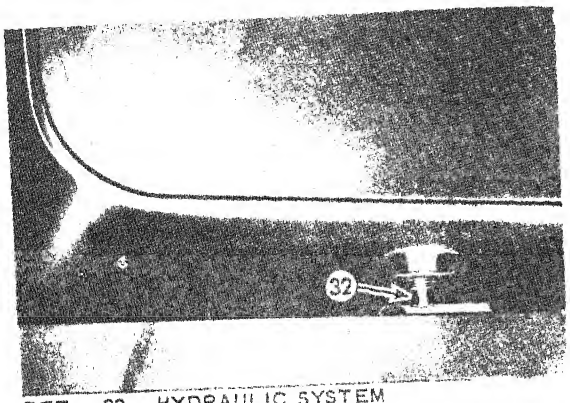
REF. 26. TRANSMISSION BREATHER



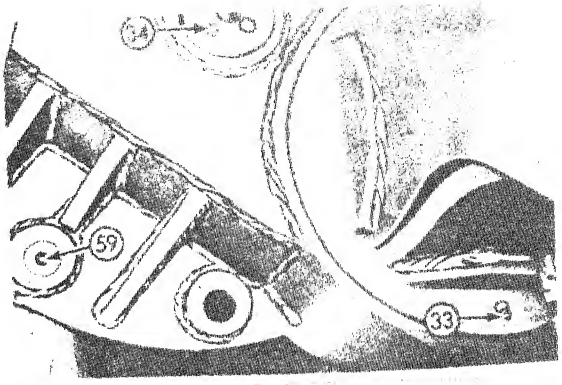
REF. 29. CLUTCH BRAKE SHAFT BEARINGS

EMC 3805-210-10/11 (8)

References 18 through 22, 25, 26, 29, 39, 40, and 63
Figure 11—Continued.



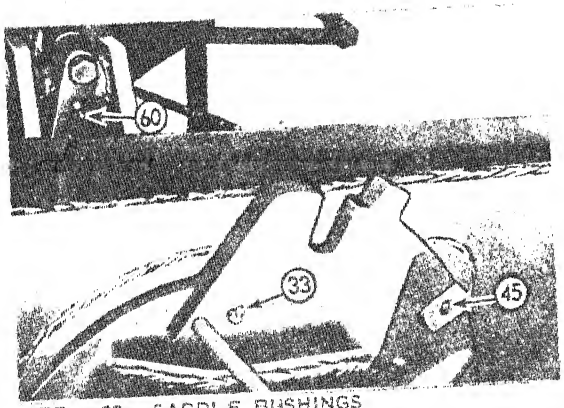
REF. 32. HYDRAULIC SYSTEM DRAIN PLUG



REF. 33. SADDLE BUSHINGS

REF. 34. SIDE SHIFT ARM BEARING

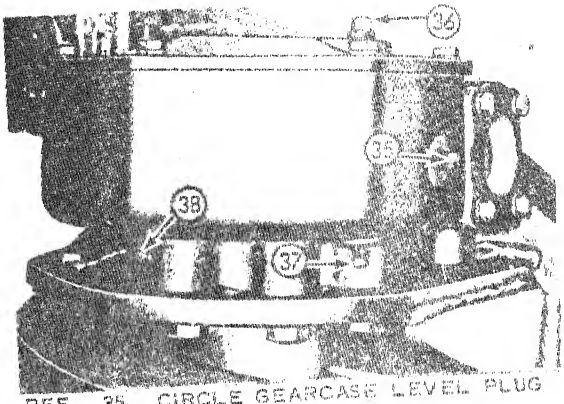
REF. 59. INDEX PIN LEFT SIDE



REF. 33. SADDLE BUSHINGS

REF. 45. INDEX PIN RIGHT SIDE

REF. 60. SCARIFIER CYLINDER

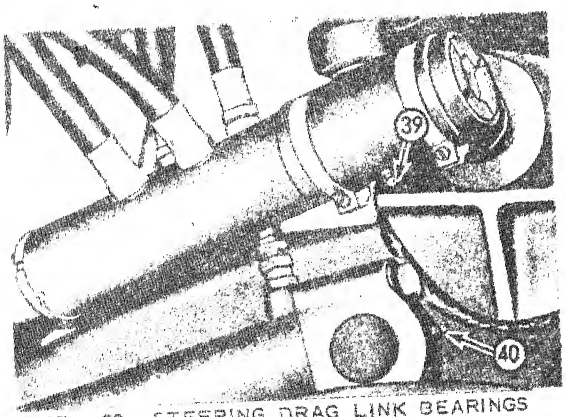


REF. 35. CIRCLE GEARCASE LEVEL PLUG

REF. 36. CIRCLE GEARCASE FILL AND DIPSTICK

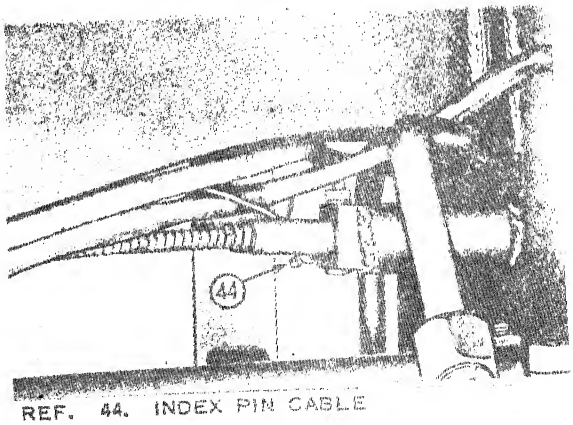
REF. 37. CIRCLE GEARCASE DRAIN

REF. 38. CIRCLE GEARCASE BEARING



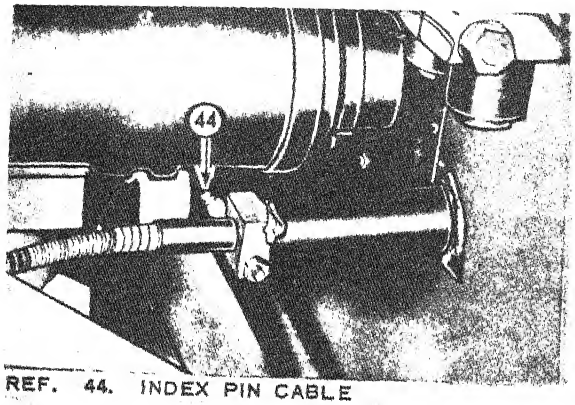
REF. 39. STEERING DRAG LINK BEARINGS

REF. 40. STEERING CYLINDER BEARINGS

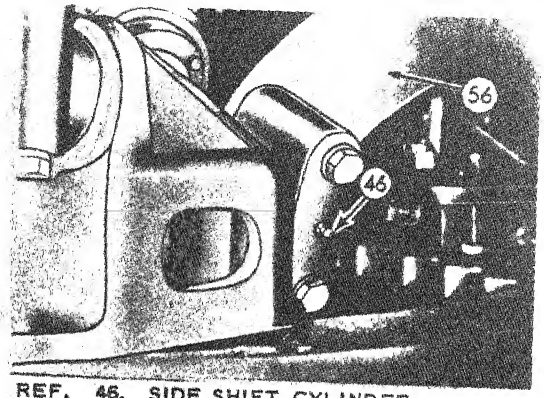


REF. 44. INDEX PIN CABLE

References 32 through 40, 44, 45, 59, and 60
Figure 11—Continued.

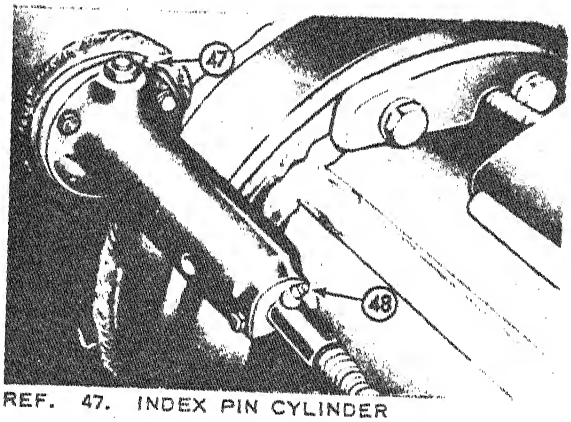


REF. 44. INDEX PIN CABLE



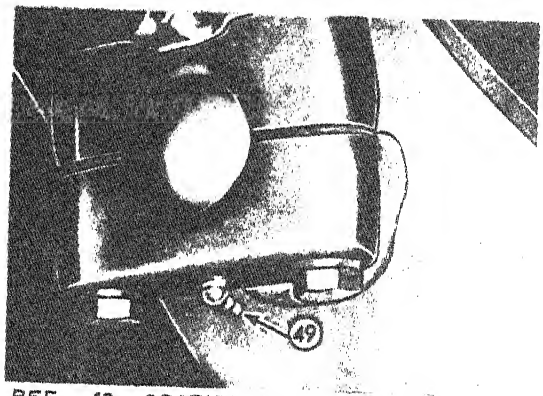
REF. 46. SIDE SHIFT CYLINDER BALL JOINT

REF. 56. CIRCLE

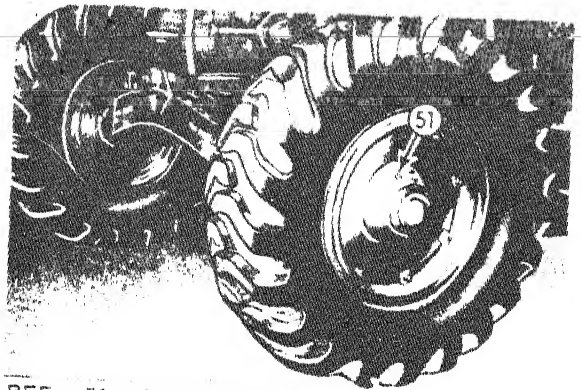


REF. 47. INDEX PIN CYLINDER

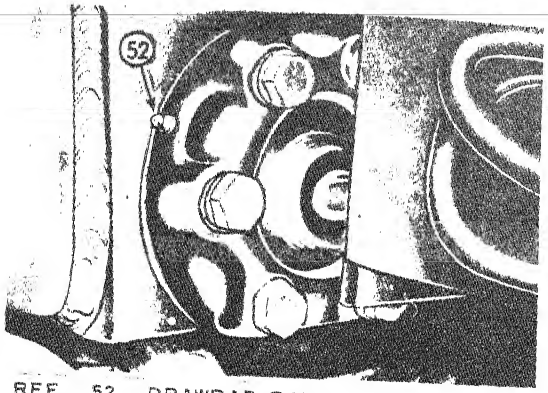
REF. 48. INDEX PIN CABLE



REF. 49. SCARIFIER LIFT LINK

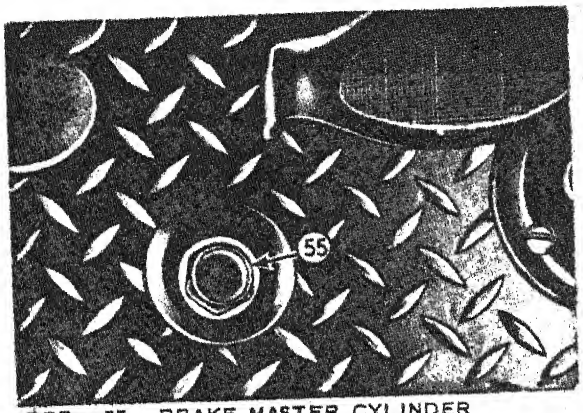


REF. 51. FRONT WHEEL BEARINGS

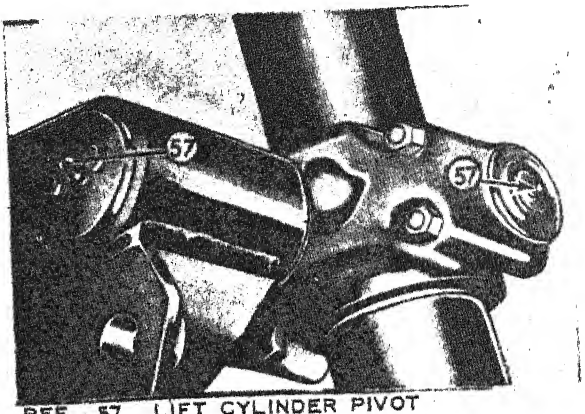


REF. 52. DRAWBAR BALL SOCKET

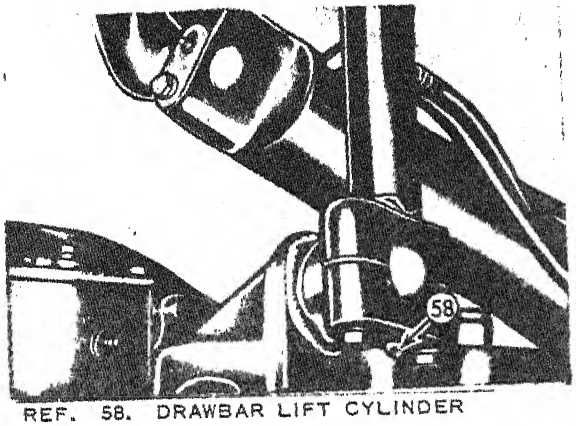
References 44, 46, through 49, 51, 52, and 56
Figure 11—Continued.



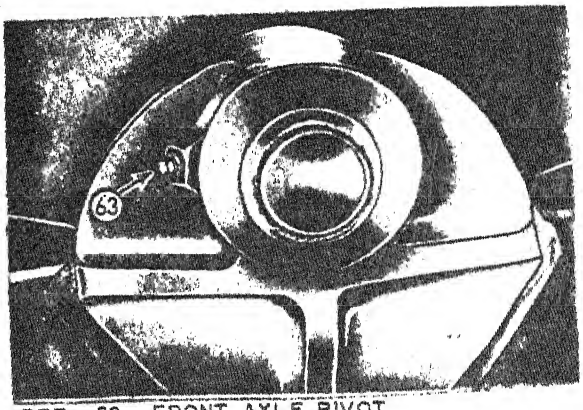
REF. 55. BRAKE MASTER CYLINDER FILL AND LEVEL PLUG



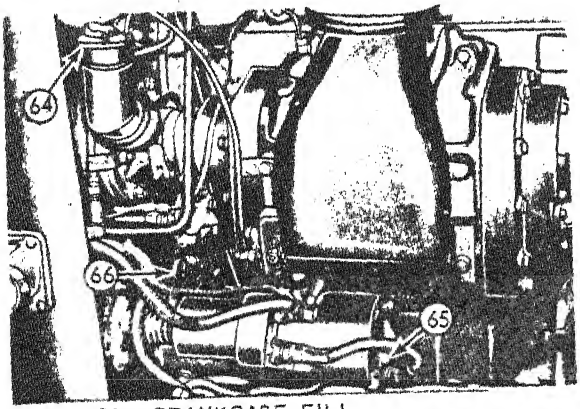
REF. 57. LIFT CYLINDER PIVOT



REF. 58. DRAWBAR LIFT CYLINDER



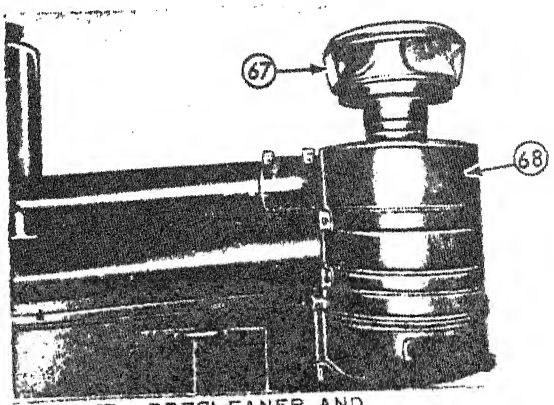
REF. 63. FRONT AXLE PIVOT



REF. 64. CRANKCASE FILL

REF. 65. STARTER BEARINGS

REF. 66. CRANKCASE OIL LEVEL GAGE



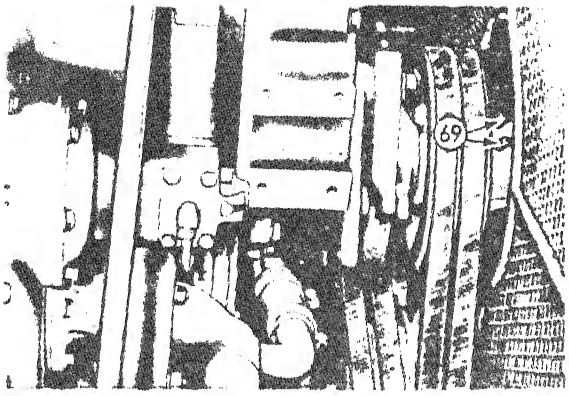
REF. 67. PRECLEANER AND SIGHT GLASS

REF. 68. AIR CLEANER

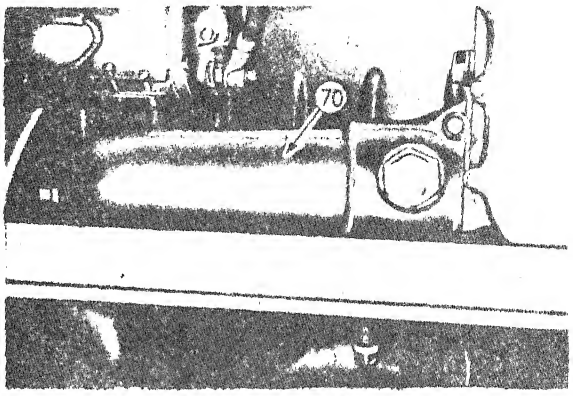
FMC 3805-210-10/11(11)

References 55, 57, 58, and 68 through 68

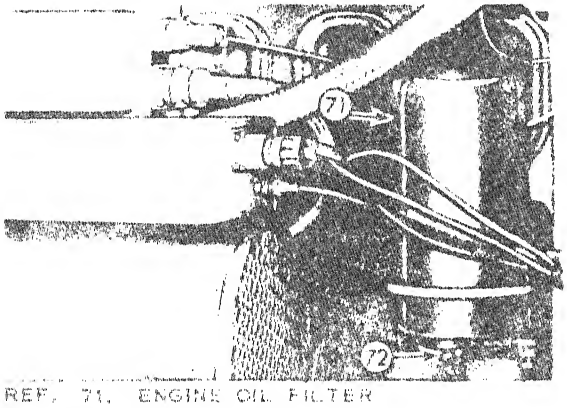
Figure 11—Continued.



REF. 69. FAN HUB BEARING

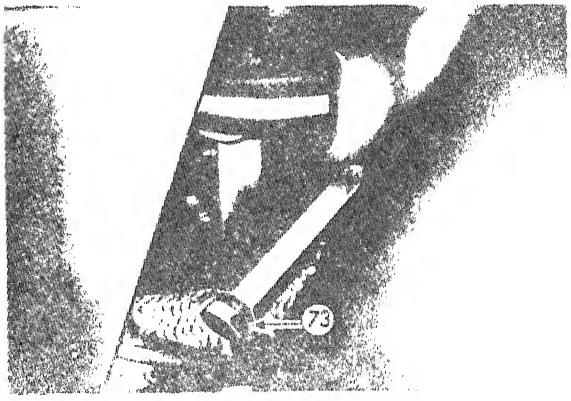


REF. 70. ENGINE OIL FILTER



REF. 71. ENGINE OIL FILTER

REF. 72. ENGINE OIL FILTER DRAIN



REF. 73. CRANKCASE DRAIN PLUG

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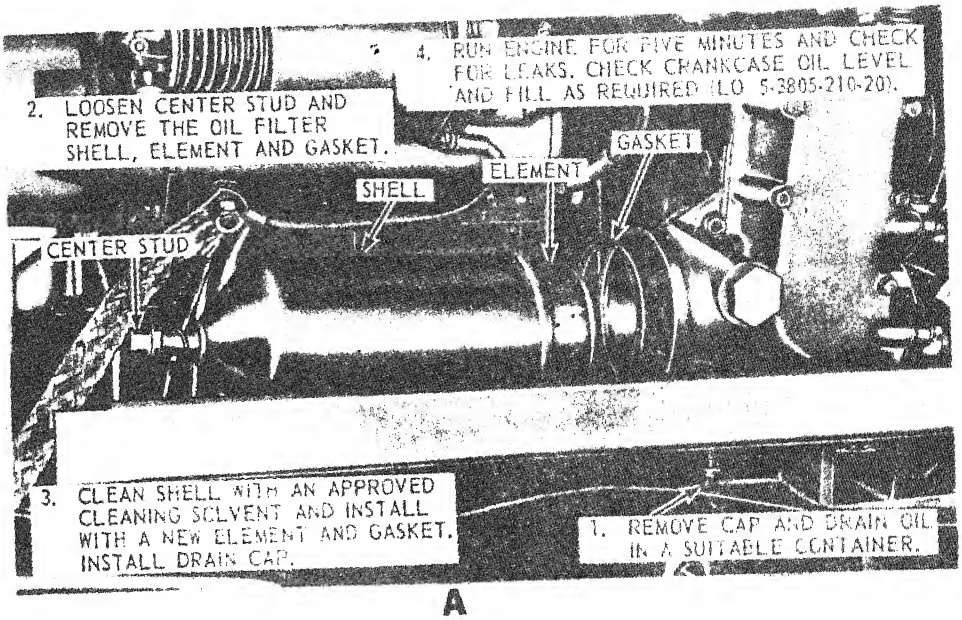
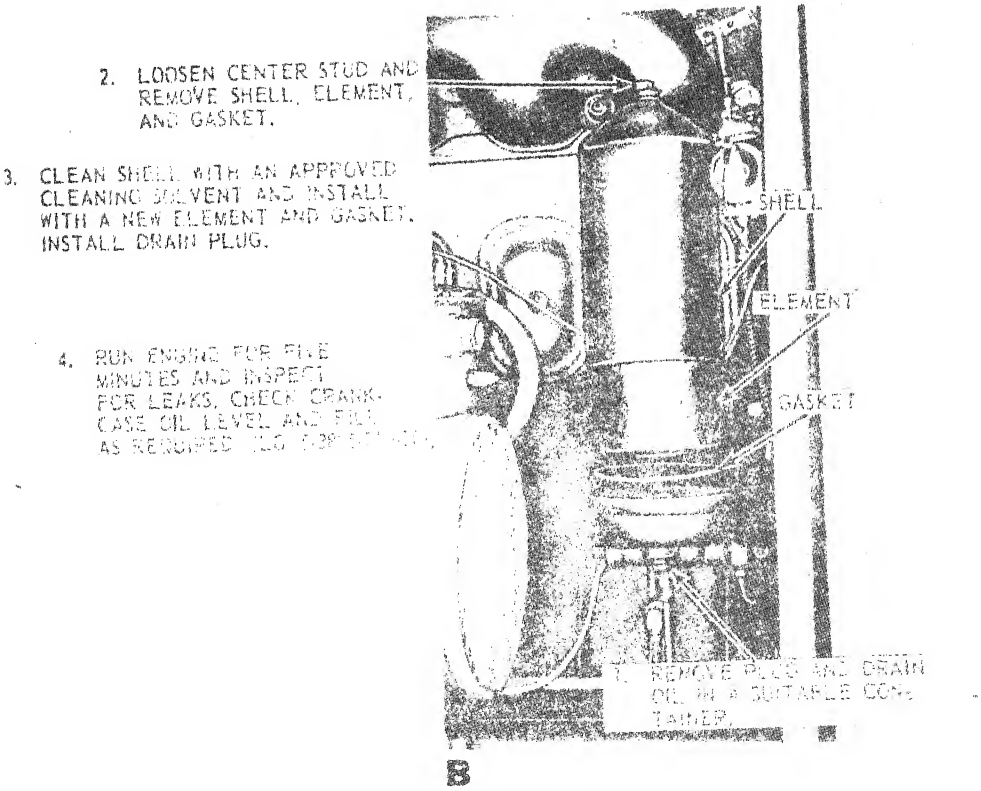
References 69 through 73

Figure 11—Continued.



A



B

EMC 3805-210-10/12

A—Primary oil filter

B—Secondary oil filter

Figure 12. Primary and secondary oil filter service.

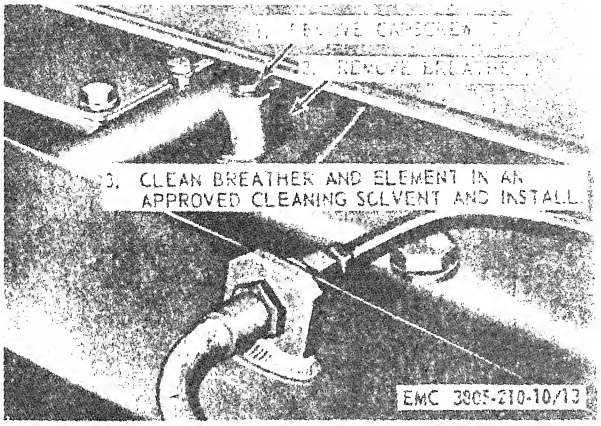
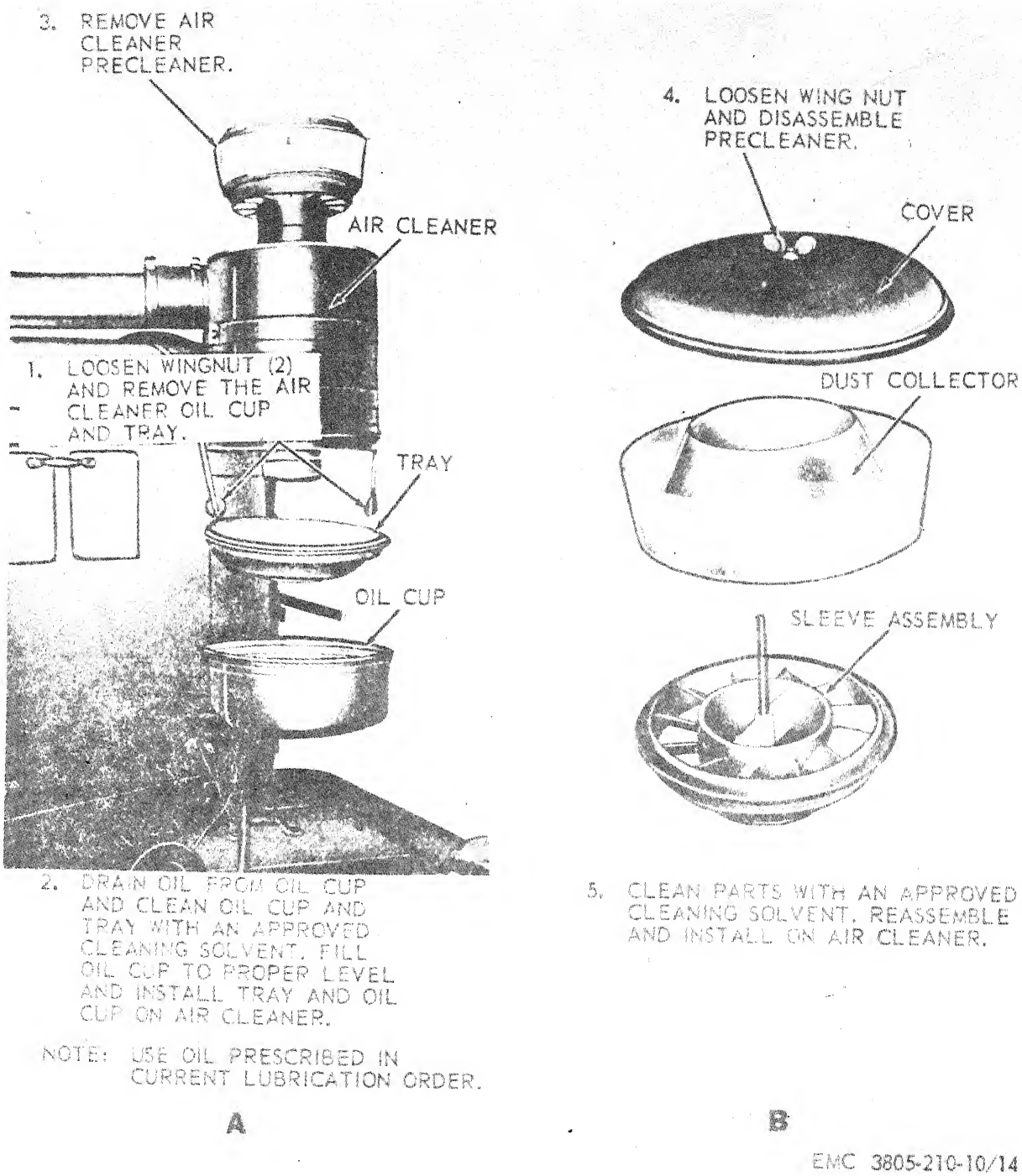


Figure 13. Transmission breather service.



A—Air cleaner service
B—Precleaner service

Figure 14. Air cleaner and precleaner service.

Section III. PREVENTIVE MAINTENANCE

32. General

To insure that the equipment is ready for operation at all times, it must be inspected systematically before operation, during operation, and after operation, so that defects may be discovered and corrected before they result in serious damage or failure. The necessary preventive maintenance services will be performed before operation. Defects discovered during operation of the unit will be noted for future correction, to be made as soon as operation has ceased. Stop operation immediately if a deficiency is noticed during operation which would damage the equipment if operation were continued. After-operation services will be performed by the operator after every operating period. After-operation services will be performed at intervals based on the normal operations of the equipment. Reduce interval to compensate for abnormal conditions. Responsibility for performance of preventive maintenance services rests not only with the operator but also with the entire chain of command from section chief to commanding officer (AR 750–5).

Note. Record all uncorrected deficiencies on DA Form 2404.

33. Daily Maintenance Service and Inspection Procedures

a. General. The specific daily inspections and services that are to be performed by the operator or crew are listed below as items 1 through 13 and are to be performed at indicated intervals.

b. Specific Service and Inspection Instructions. Specific service and inspection instructions are contained in the appropriate referenced paragraphs below and on figure 15. The illustrated inspection and service intervals are indicated by an "X" in the appropriate block on each illustration as follows:

B—Before operation
D—During operation
A—After operation

Note. Detailed instructions for the applicable maintenance, service, and inspection procedures are referenced by the paragraph numbers listed.

Item		Paragraph
	Before Starting Engine	
1	*Visual inspection.* Make general inspection of the entire unit for cracks, breaks, loose or missing bolts and nuts. Check tire inflation. Normal tire pressure is 25 psi.	
2	Cutting edges, end bits, and scarifier teeth. Inspect these items for wear, damage, and missing parts. Replace or turn cutting edges or end bits damaged or worn beyond acceptable standards. Replace or turn cutting edge when worn beyond 3/4 inch of moldboard.	83
3	Cooling system, engine crankcase oil level, fan belts, and generator belts. Check coolant level. When filling the radiator with antifreeze, allow room for expansion and run engine long enough to mix the solution thoroughly. Check fan and generator belts for condition and adjustment. Belt deflection is 1/2 to 3/4 inch midway between pulleys.	60, 61, 63
4	Check fire extinguisher for condition, sufficient charge, and secure mounting. Check fuel tank level, hydraulic supply tank level, final drive, transmission transfer case, and tandem drive lubricating oil levels. Check the battery cables for tightness of mounting and electrolyte level. The electrolyte level should be 3/8 inch above the plates. Check winterization equipment for proper operation and leaks.	
5	*Tools and equipment.* Check all tools and equipment assigned to the grader, making sure they are serviceable, clean, and properly stowed or mounted.	
	Start Engine	
6	With engine running, listen for any unusual noises. Check all gages and instruments for proper operation. Check engine clutch and brake for proper operation.	
	During Operation	
7	*Engine.* During operation listen for any unusual noises and note if there is any indication of loss of power while engine is under load. Look for excessive black or blue smoke from exhaust pipe.	
8	Check all forward and reverse speed ranges, noticing if all shifts are smooth and without excessive vibration or unusual noises. Notice if	

Item	During operation—Continued	Paragraph
	clutch is not releasing properly or slipping and if brakes are grabbing or dragging. Check steering mechanism and all operating controls for proper operation.	
9	Check all instruments, gages, switches, lights, and horn for proper operation. Notice if working lights are properly aimed and securely mounted. At normal operating speed, the gage readings should be as follows: Oil pressure 40–60 psi, water temperature 160°F–180°F., ammeter in the charge range, and fuel pressure in the run range.	
10	*Temperatures.* Check transmission and tandem drive for excessive heat. An overheated gear housing indicates internal maladjustment, damage, or inadequate lubrication.	
	After Operation	
11	*Leaks.* Inspect all drive gearcases and housings for leaks. Pay particular attention to engine cooling system, lubrications, and fuel and hydraulic line connections.	
12	Inspect identification and instruction plates, paint, and marking for condition and secure mounting.	
13	Service and lubricate in accordance with LO 5–3805–210–20.	

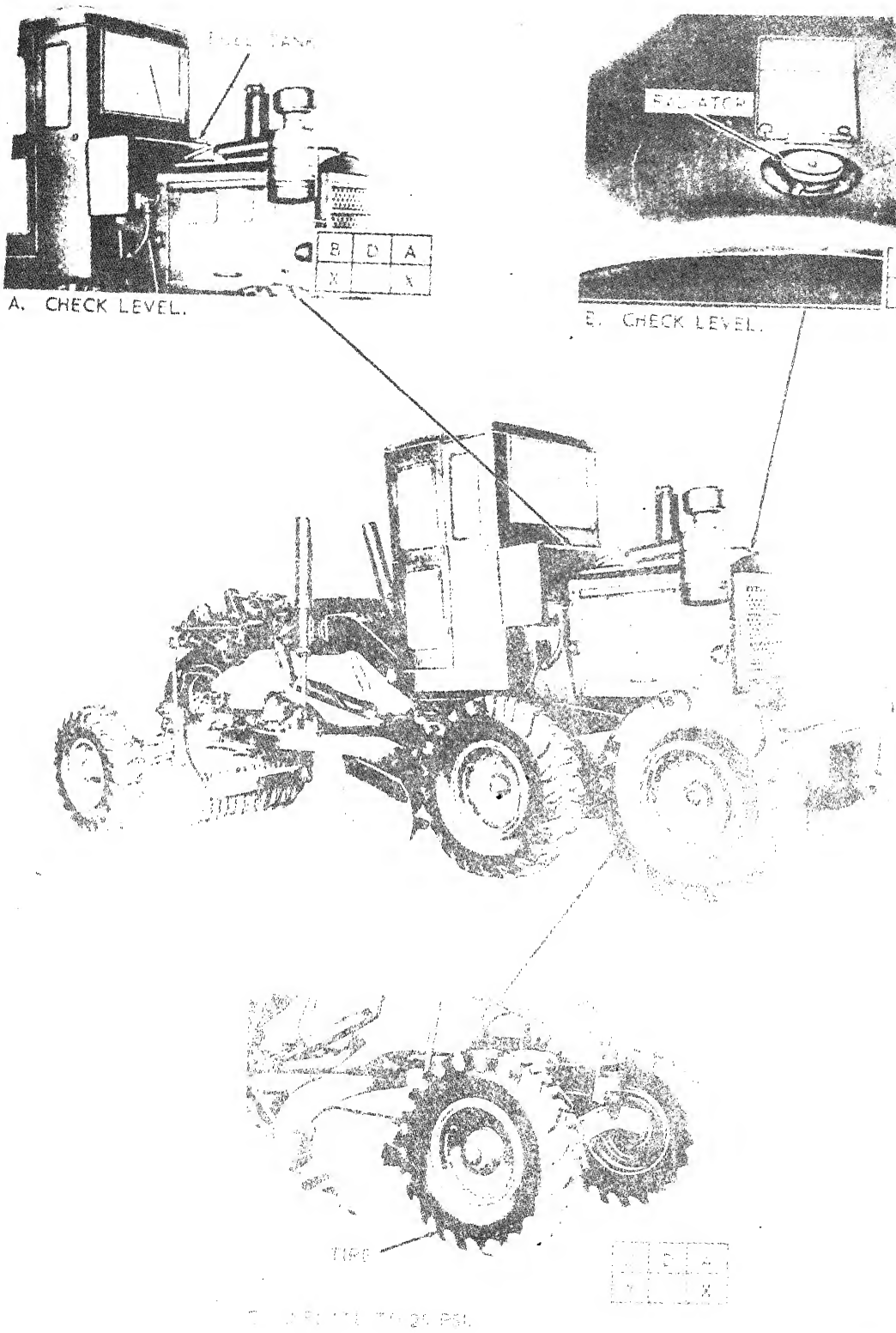


Figure 15. Operator's daily services.

Section IV. TROUBLESHOOTING

34. General

This section provides information useful in diagnosing and correcting unsatisfactory operation or failure of the road grader and its components. Each trouble symptom stated is followed by a list of probable causes of the trouble. The possible remedy recommended is described opposite the probable cause. Any operational trouble beyond the scope of the operator or crew shall be reported to organizational maintenance.

35. Engine Hard to Start or Fails to Start

Probable cause	*Possible remedy*
Fuel filters clogged	Service fuel filters (pars. 57 and 58).
Water in fuel system	Drain the fuel system (par. 55) and service fuel filters (pars. 57 and 58).
No fuel pressure	Report to organizational maintenance.
Throttle not in starting position.	Position throttle correctly (par. 13).
Air in fuel system	Tighten fuel lines on suction side of fuel pump and fuel filters (pars. 57 and 58).

36. Engine Misses or Runs Erratically

Probable cause	*Possible remedy*
Water in fuel system	Drain the fuel tank (par. 55) and service fuel filters (pars. 57 and 58).
Defective injectors	Report to organizational maintenance.

37. Engine Stops Suddenly

Probable cause	*Possible remedy*
Fuel tank empty	Fill fuel tank (par. 55).
Fuel filters clogged	Service fuel filters (pars. 57 and 58).
Water in fuel system	Drain fuel tank (par. 55) and service fuel filters (pars. 57 and 58).

38. Engine Lacks Power

Probable cause	*Possible remedy*
Air cleaner clogged	Service air cleaner (par. 31).
Fuel filters clogged	Service fuel filters (pars. 57 and 58).

39. Engine Has Low or No Oil Pressure

Probable cause	*Possible remedy*
Oil supply in crankcase low.	Refill crankcase (LO 5–3805–210–20).
Crankcase oil diluted with fuel oil.	Report to organizational maintenance

40. Excessive Engine Oil Consumption

Probable cause	*Possible remedy*
Engine oil level too high	Drain crankcase to proper level (LO 5–3805–210–20).
Oil lines leaking	Tighten connections. Report a broken line to organizational maintenance.

41. Engine Overheats

Probable cause	*Possible remedy*
Coolant level low	Fill cooling system (par. 60).
Radiator clogged	Flush cooling system.
Radiator core external surface dirty.	Remove dirt and foreign material from core.
Radiator shutter closed	Open shutter (par. 13).
Fan belt slipping	Adjust fan belt (par. 61).

42. Engine Exhaust Smoky

Probable cause	*Possible remedy*
Air cleaner dirty	Service air cleaner (par. 31).
Excessive oil in crankcase	Drain crankcase to proper level (LO 5–3805–210–20).
Too much oil in air cleaner.	Service air cleaner (par. 31).

43. Hydraulic Brakes Do Not Hold

Probable cause	*Possible remedy*
Fluid low in master cylinder.	Fill the master cylinder (LO 5–3805–210–20).
Fluid leaks in hydraulic lines.	Tighten connecting nuts. Report broken lines to organizational maintenance.
Brakes out of adjustment	Adjust brakes (par. 74).

44. Hydraulic Controls Inoperative

Probable cause	*Possible remedy*
Hydraulic oil supply low	Fill hydraulic tank (LO 5–3805–210–20).
Hydraulic oil strainer clogged.	Service hydraulic oil strainer (par. 76).

45. Blade Will Not Cut

Probable cause	*Possible remedy*
Moldboard cutting edge worn.	Replace cutting edge (par. 83).
End bits worn	Replace end bits (par. 83).
Moldboard improperly adjusted.	Adjust moldboard (par. 84).
Ground too hard	Use scarifier (par. 15).

46. Scarifier Vibrates, Chatters, or Will Not Cut

Probable cause	*Possible remedy*
Bolts loose in scarifier block.	Tighten bolts.
Scarifier improperly adjusted.	Adjust scarifier (par. 80).
Scarifier teeth worn	Replace teeth (par. 81).

47. Engine Coolant Heater Inoperative

Probable cause	*Possible remedy*
Fuel tank empty	Fill fuel tank (par. 55).
Fuel filter clogged	Service fuel filter (par. 87).

48. Personnel Space Heater Inoperative

Probable cause	*Possible remedy*
Fuel tank empty	Fill fuel tank (par. 55).
Fuel filter clogged	Service fuel filter (par. 87).

49. Battery Heater Inoperative

Probable cause	*Possible remedy*
Fuel tank empty	Fill fuel tank (par. 55).
Fuel filter clogged	Service fuel filter (par. 87).

Section V. FIELD EXPEDIENT REPAIRS

50. Field Expedient Repairs

Operational troubles may occur while the road grader is operating in the field where supplies and repair parts are not available and normal corrective action cannot be performed. When this condition exists, the following expedient remedies may be used during emergencies, upon the decision of the unit commander. Equipment so repaired must be removed from operation as soon as possible and properly repaired before being placed in operation again.

51. Engine Lacks Power

Trouble	*Expedient remedy*
Fuel filters clogged	Remove elements and operate without them until new ones can be obtained (pars. 57 and 58).

52. Engine Oil Pressure Above Normal

Trouble	*Expedient remedy*
Oil filter elements clogged.	Remove elements and operate without them until new ones can be obtained (par. 31).

53. Engine Fails To Start

Trouble	*Expedient remedy*
Fuel line or hose cracked or broken.	Wrap fuel line with tape and operate until line can be obtained.

Section VI. FUEL SYSTEM

54. General

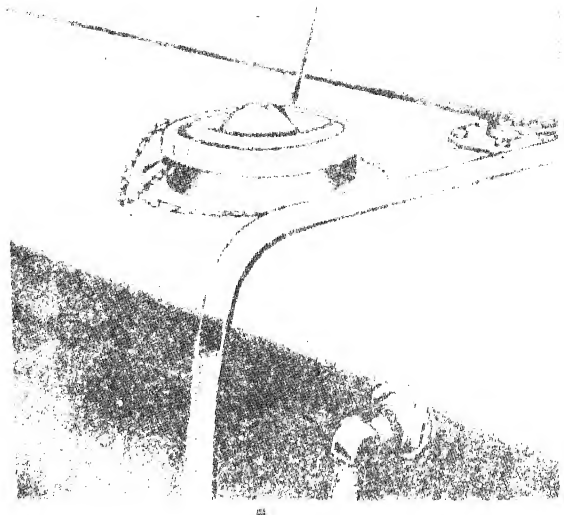
This section contains maintenance procedures for the components of the engine fuel system for which the operator is responsible. These are the fuel tank, fuel tank strainer, and fuel filters.

55. Fuel Tank Service

Service the diesel fuel tank as instructed on figure 16.

56. Fuel Tank Strainer Service

Service the fuel tank strainer as instructed on figure 17.



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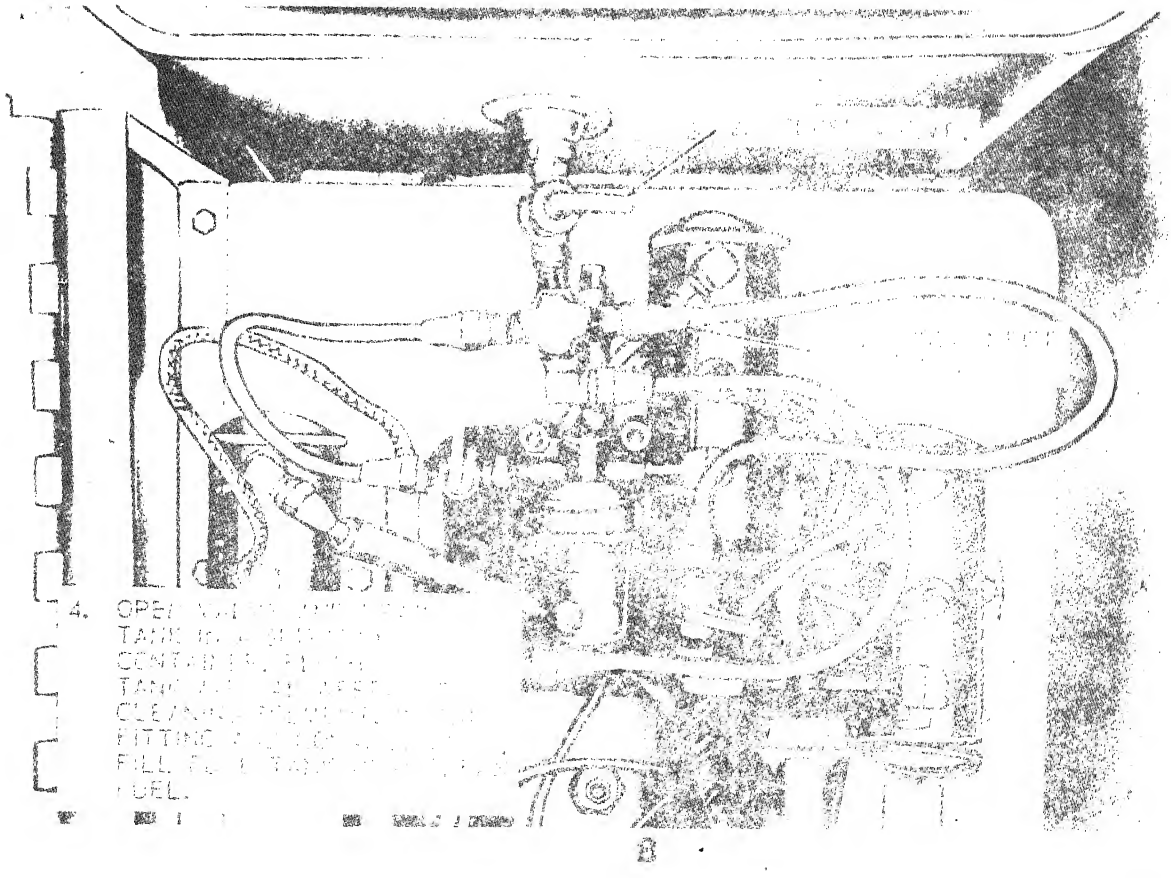


B

A—Fuel tank

B—Fuel tank drain

Figure 16. Diesel engine fuel tank service.

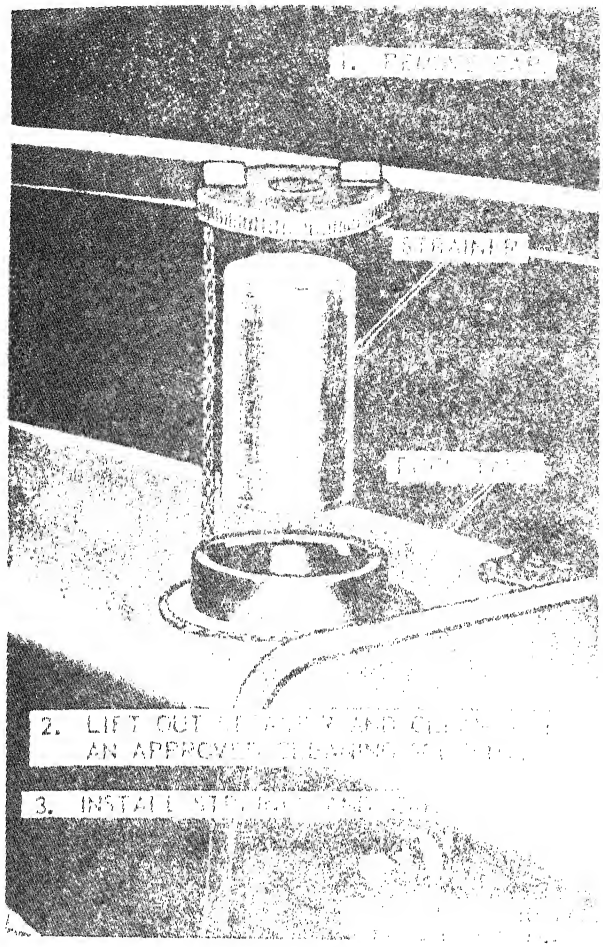


Figure 17. Fuel tank strainer service.

57. Primary Fuel Filter Service

Service the primary fuel filter as instructed on figure 18.

58. Secondary Fuel Filter Service

Service the secondary fuel filter as instructed on figure 19.

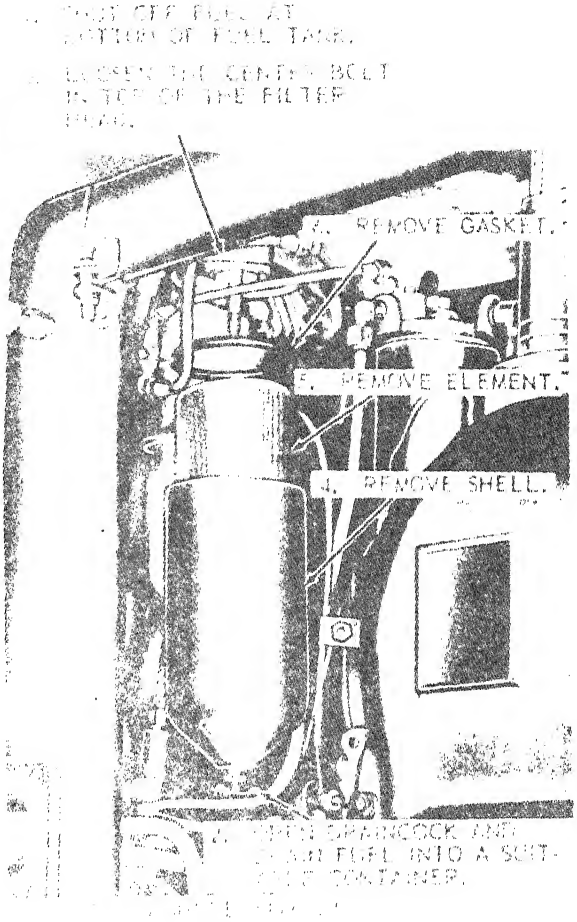
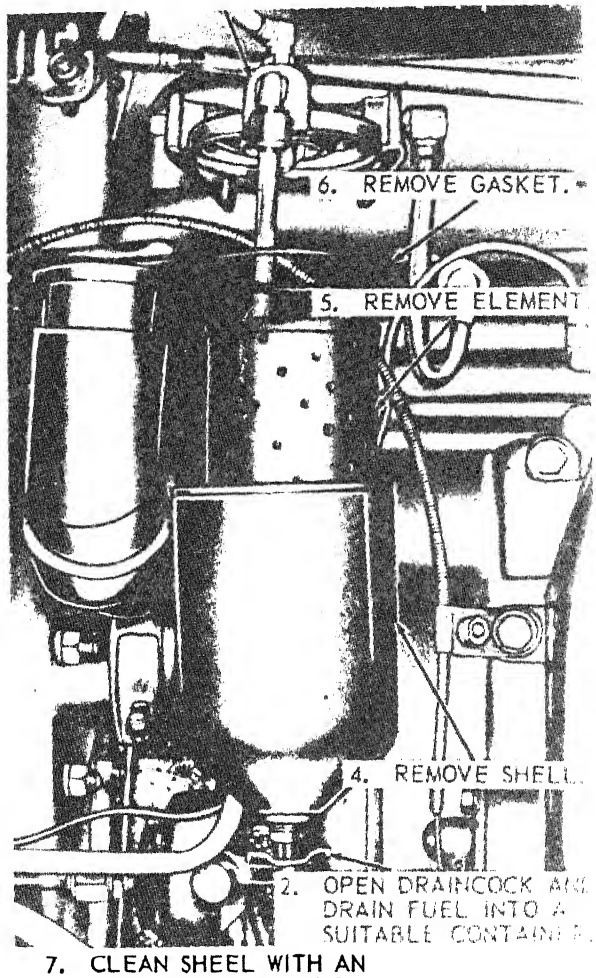


Figure 18. Primary fuel filter service.

1. SHUT OFF FUEL AT BOTTOM OF FUEL TANK.

3. LOOSEN CENTER BOLT IN TOP OF FILTER HOOD.



7. CLEAN SHEEL WITH AN APPROVED CLEANING SOLVENT AND INSTALL WITH NEW ELEMENT AND GASKET.

8. CLOSE DRAINCOCK AND OPEN FUEL TANK VALVE. RUN ENGINE FIVE MINUTES AND INSPECT FOR LEAKS AROUND FILTER.

EMC 3805-210-10/19

Figure 19. Secondary fuel filter service.

Section VII. COOLING SYSTEM

59. General

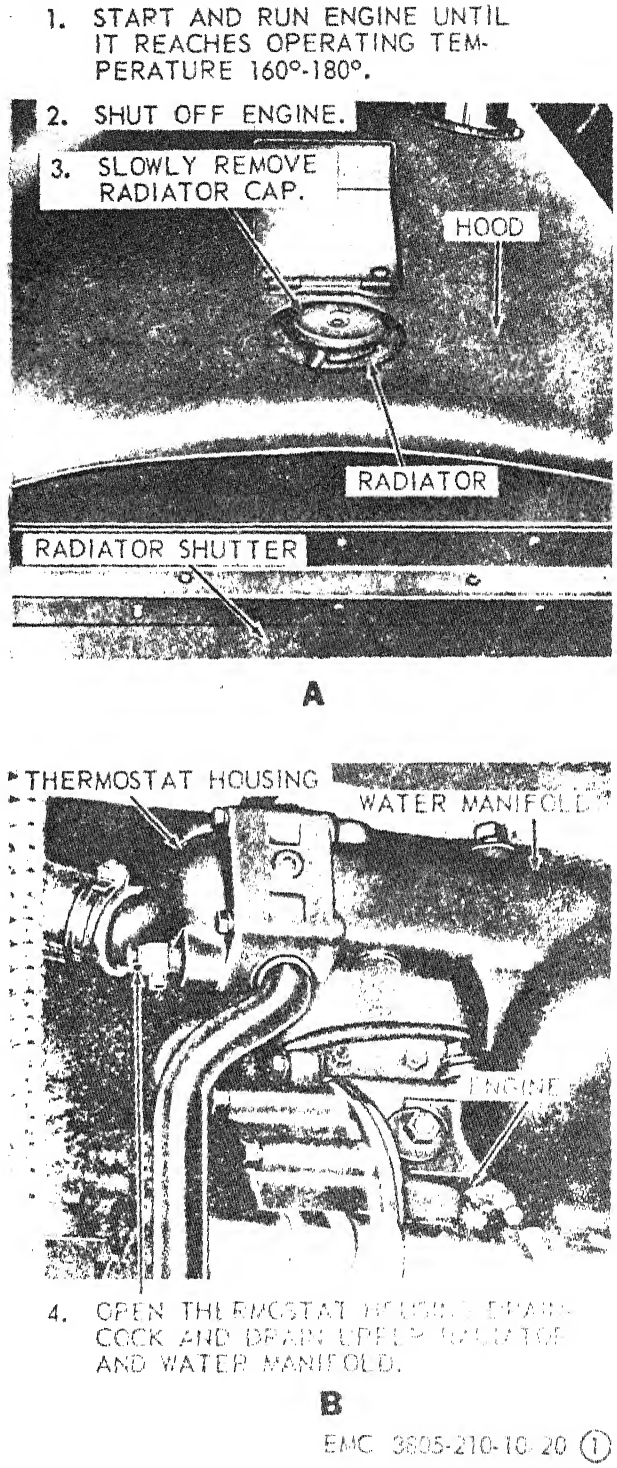
This section describes the maintenance procedures and service of the cooling system for which the operator is responsible. These are the radiator and fan belts.

60. Radiator Service

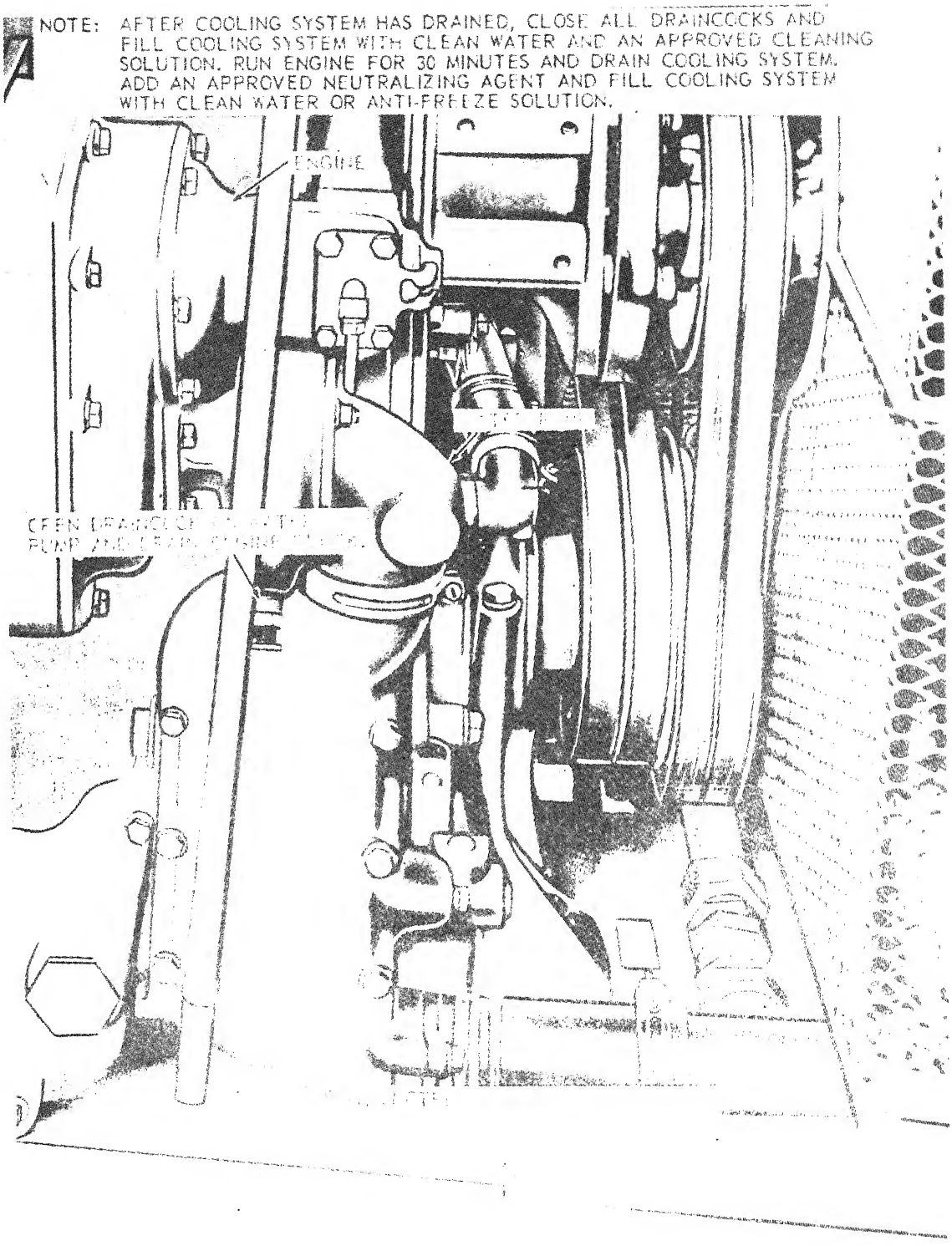
Service the radiator as instructed on figure 20.

61. Fan Belt Adjustment

Adjust the fan belts as instructed on figure 21.



A—Radiator cap
B—Thermostat housing drain
Figure 20. Radiator service.



C—Cooling system drain

Figure 20—Continued.

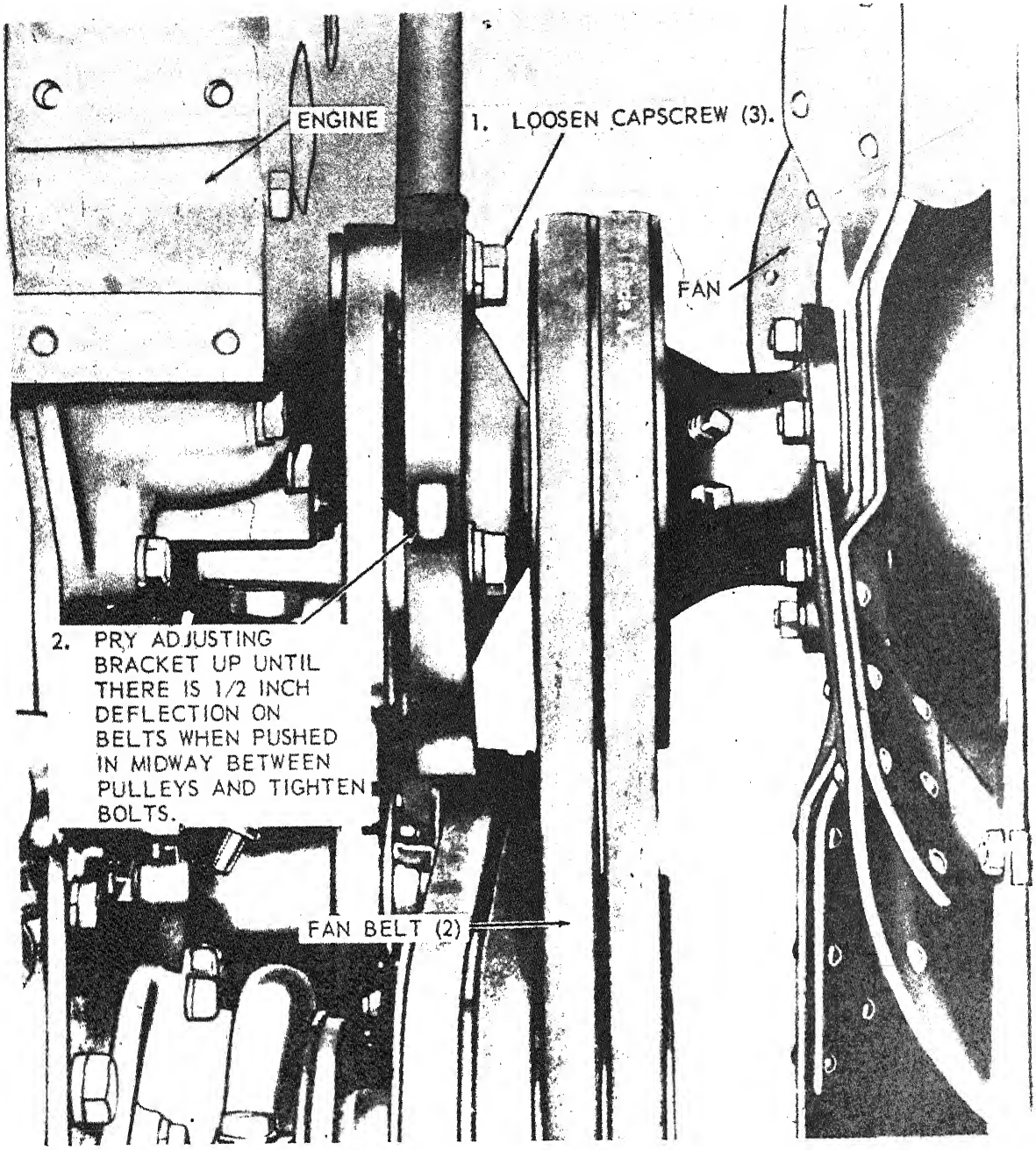


Figure 21. Fan belt adjustment.

Section VIII. ELECTRICAL SYSTEM

62. General

This section describes the maintenance procedures and service of the electrical system which are the responsibility of the operator. These are the generator drive belts, batteries, instrument panel and trouble light lamps.

63. Generator Drive Belt Adjustment

Adjust the generator drive belt as instructed on figure 22.

64. Battery Service

Service the batteries as instructed on figure 23.

65. Instrument Panel Lamp Replacement

a. Removal. Remove the instrument panel lamp as instructed on figure 24.

b. Installation. Install the instrument panel lamp in reverse of the instructions on figure 24.

66. Trouble Light Lamp

a. Removal. Press in on the lamp and turn it clockwise until it releases from the socket.

b. Installation. Press a new bulb into the socket and turn it clockwise until it is locked in the socket.

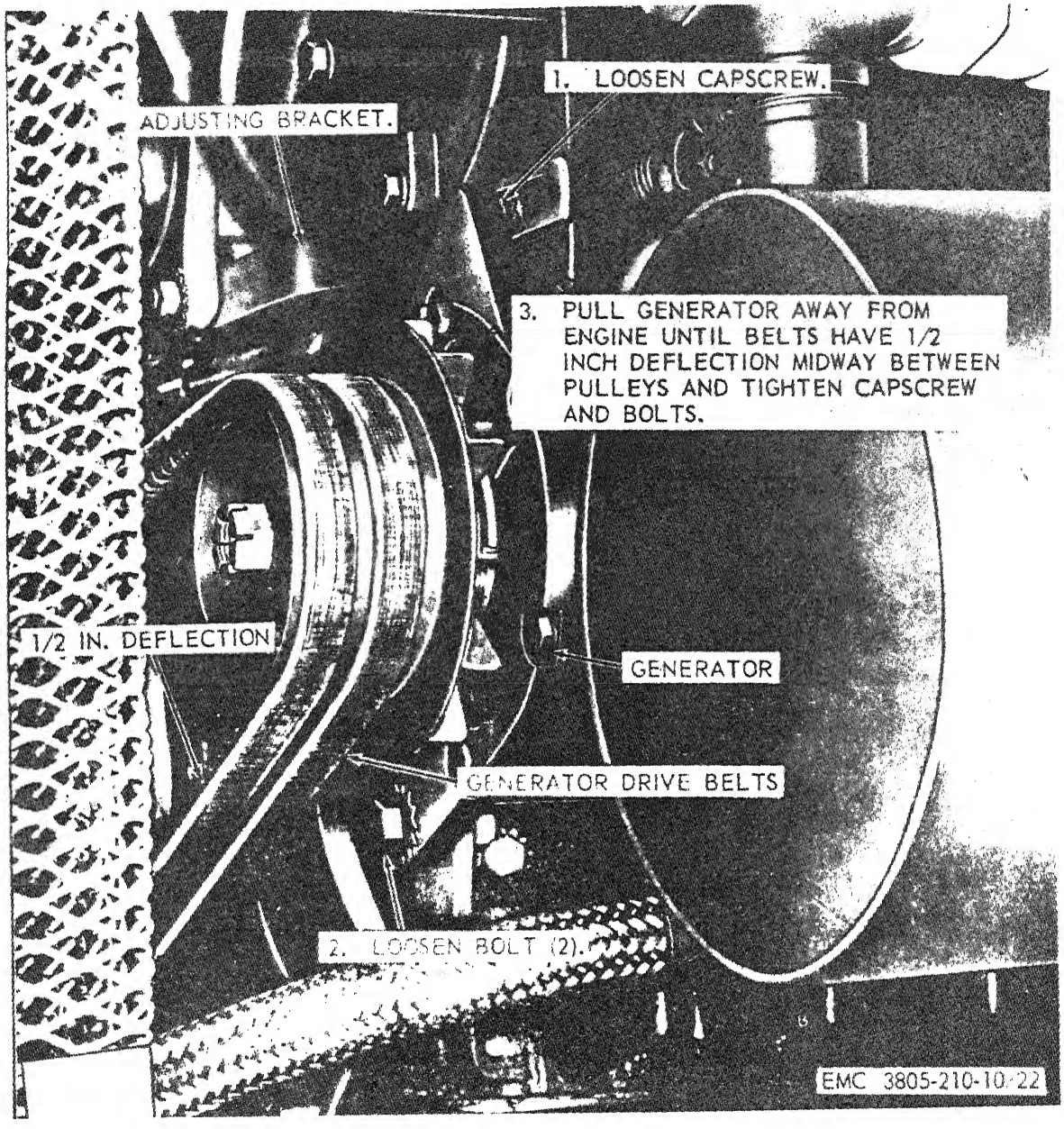


Figure 22. Generator drive belt adjustment.

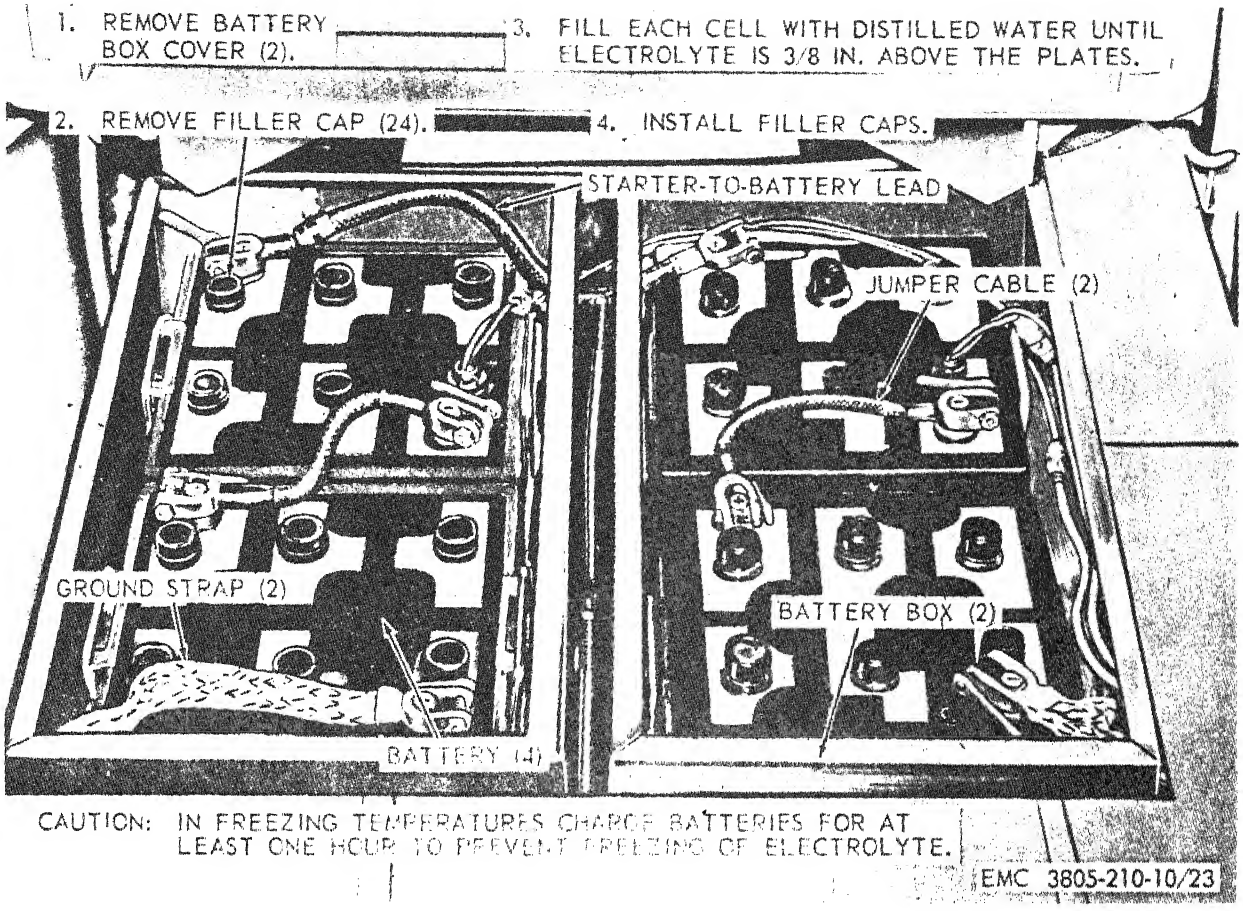


Figure 23. Battery service.

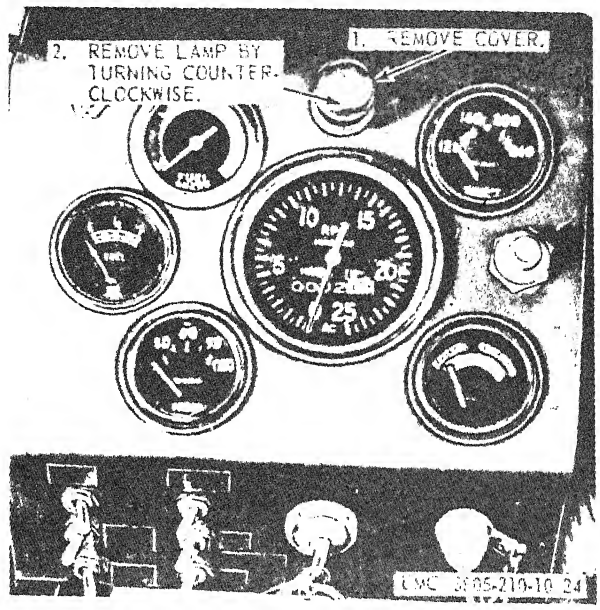


Figure 24. Instrument panel lamp replacement.

Section IX. CLUTCH RELEASE MECHANISM AND BRAKE

67. General

The clutch release mechanism transmits pressure applied on the clutch pedal to the clutch linkage. A common linkage applies the clutch brake which stops the transmission gears from turning, allowing the operator to shift the transmission gears into various speed ranges.

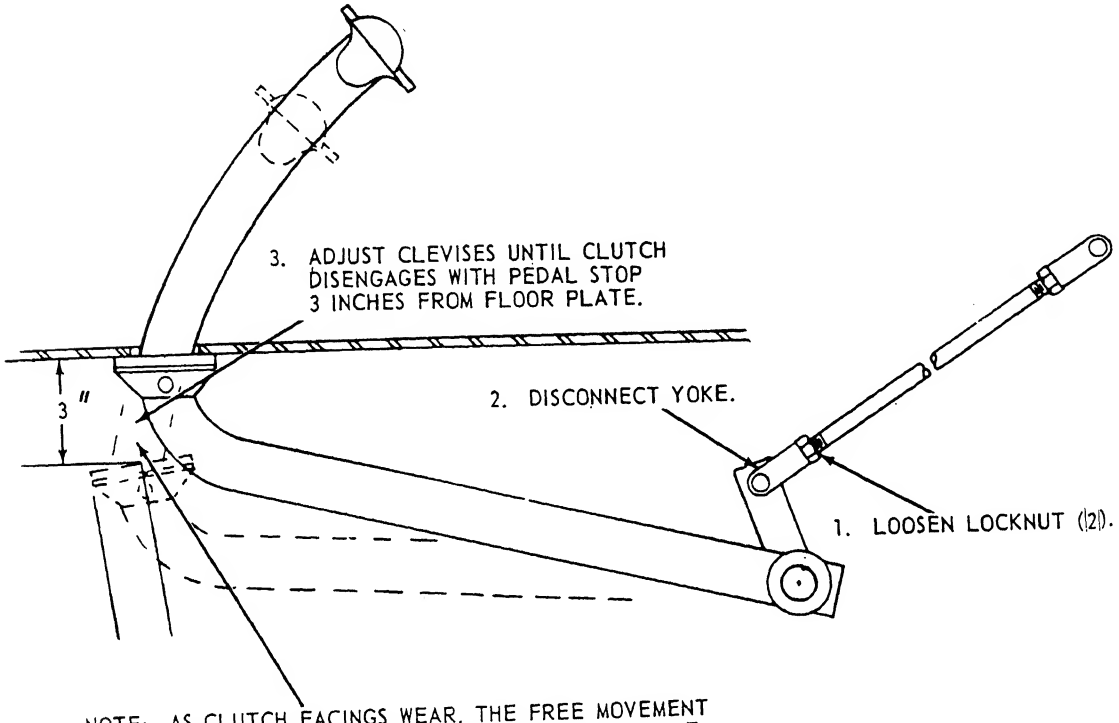
68. Clutch Release Mechanism Adjustment

Adjust the clutch release mechanism as instructed on figure 25.

69. Clutch Brake Adjustment

Adjust the clutch brake as instructed on figure 26.

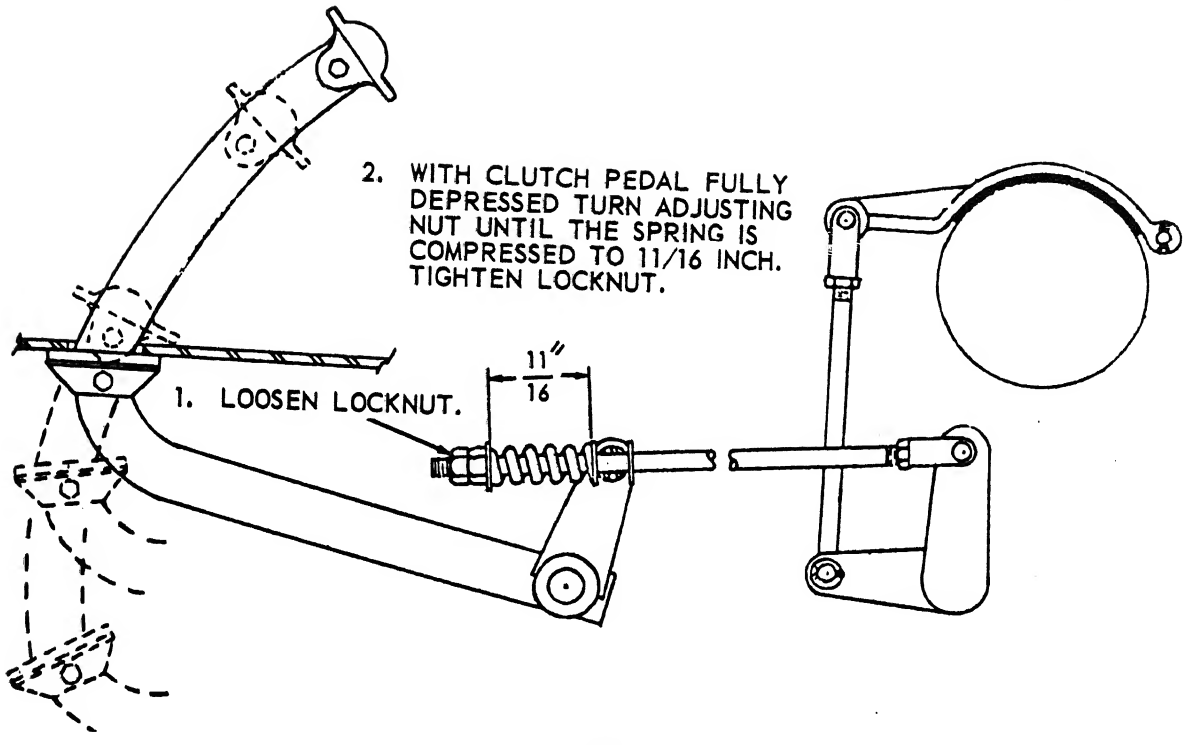
NOTE: THERE SHOULD BE SIX AND ONE-HALF INCHES OF TRAVEL FOR COMPLETE DISENGAGEMENT OF CLUTCH AND ENGAGEMENT OF CLUTCH BRAKE.



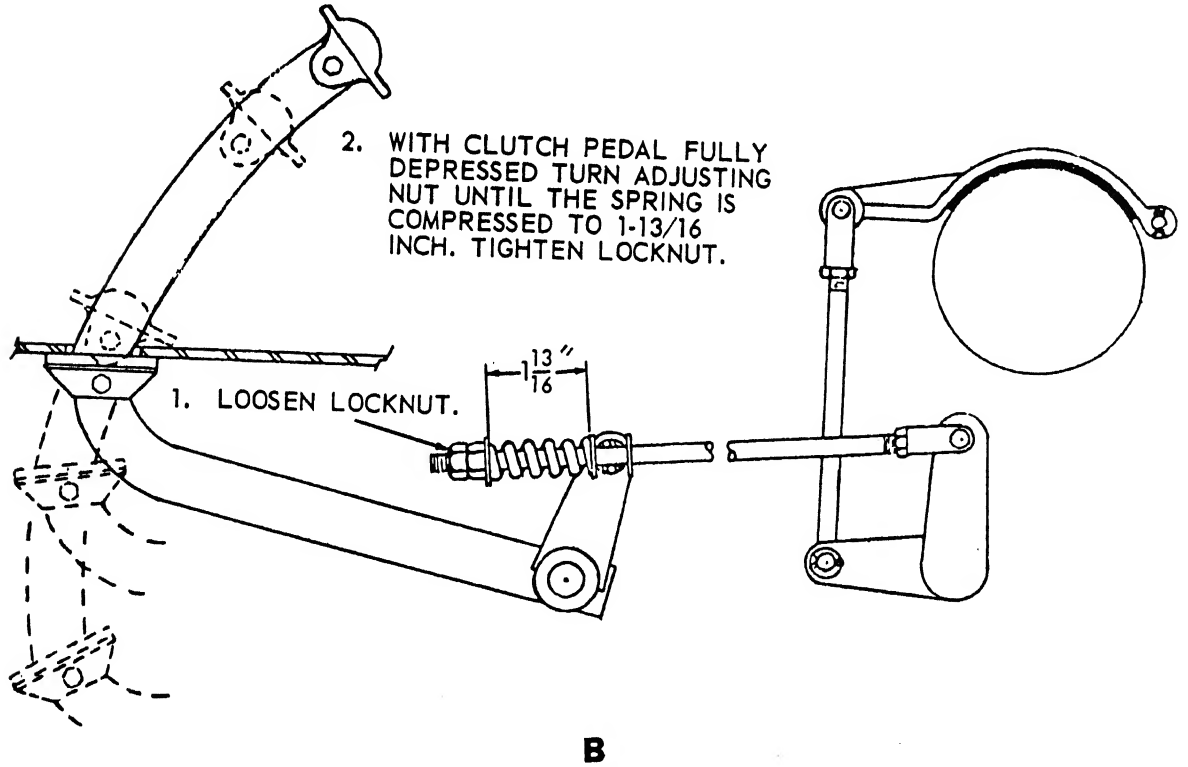
NOTE: AS CLUTCH FACINGS WEAR, THE FREE MOVEMENT DECREASES AND ADJUSTMENTS SHOULD BE MADE BEFORE THIS DIMENSION HAS BECOME LESS THAN TWO INCHES MINIMUM.

EMC 3805-210-10/25

Figure 25. Clutch release mechanism adjustment.



A



B

EMC 3805-210-10/26

A—Clutch brake adjustment (Serial range MD–101 through MD–971)
B—Clutch brake adjustment (Serial range MD–972 through MD–1107)

Figure 26. Clutch brake adjustment.

Section X. HANDBRAKE

70. General

The handbrake lever is located in the operator's cab to the left of the steering wheel. The handbrake lever is used to engage the grader brakes when the grader is parked or not in operation.

71. Handbrake Adjustment

Adjust the handbrake as instructed on figure 27.

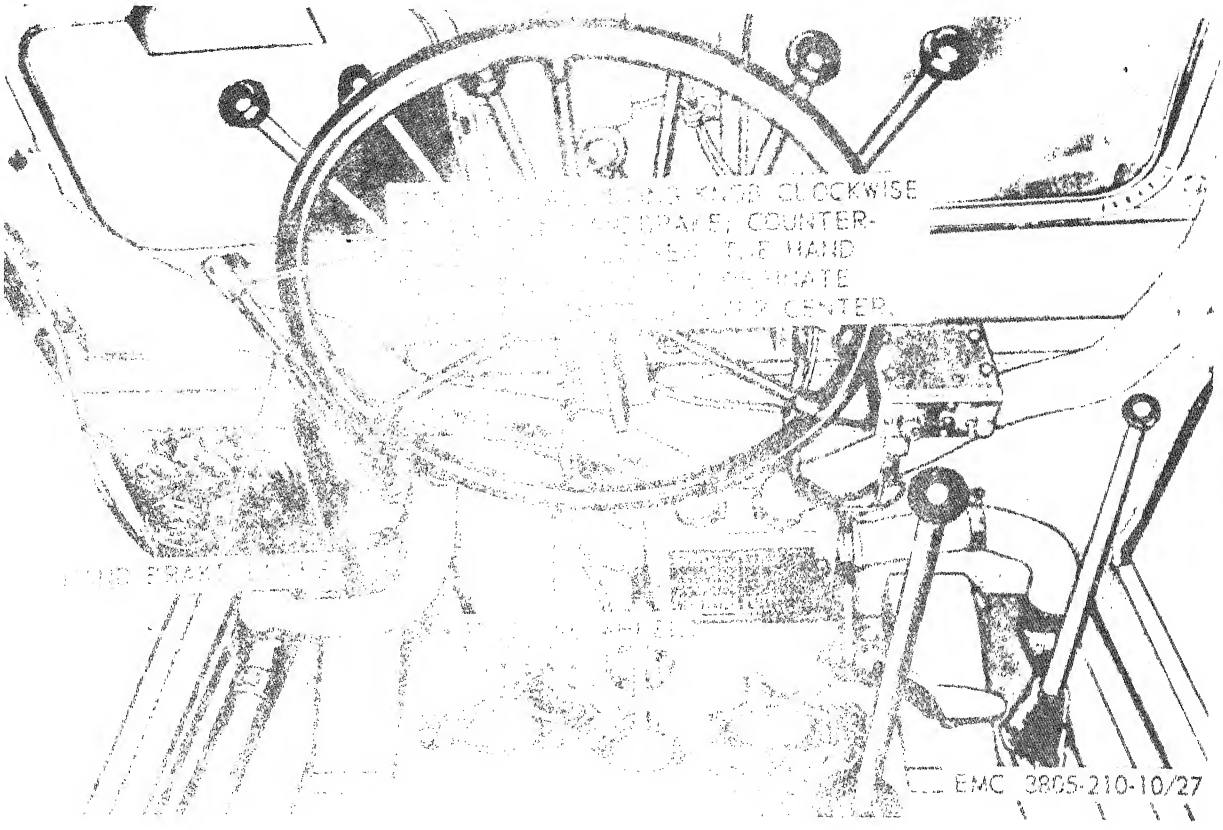


Figure 27. Handbrake adjustment.

Section XI. SERVICE BRAKE SYSTEM

72. General

The grader service brake system is hydraulically operated. It consists of a master cylinder, wheel cylinders, and lines and fittings necessary to complete the system. Foot pressure applied to the pedal transmits hydraulic fluid from the master cylinder to the wheel cylinders which in turn actuate the brakeshoes.

73. Master Cylinder Service

Service the master cylinder as instructed on figure 28.

74. Service Brake Adjustment

Adjust the service brakes as instructed on figure 29.

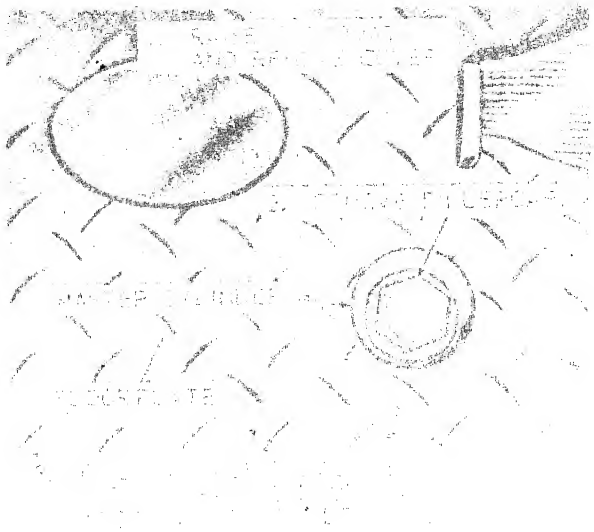


Figure 28. Master cylinder service.

Figure 29. Service brake adjustment.

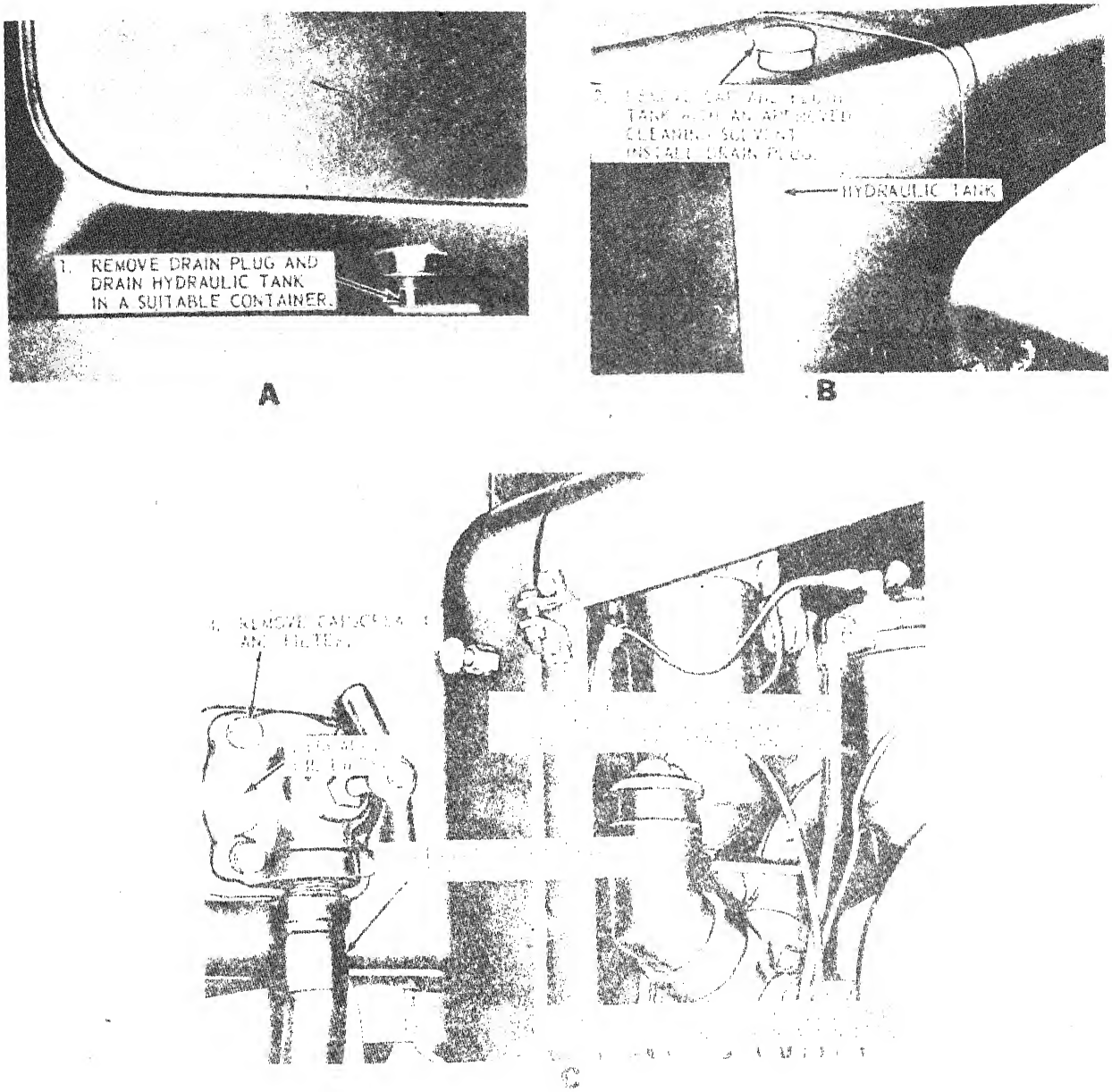
Section XII. HYDRAULIC SYSTEM

75. General

This section describes the maintenance and service procedures on the hydraulic system which are the responsibility of the operator. These are the hydraulic tank and strainer.

76. Hydraulic Tank and Strainer Service

Service the hydraulic tank and strainer as instructed on figure 30.



A—Hydraulic tank drain
B—Hydraulic tank
C—Hydraulic oil strainer

Figure 30. Hydraulic tank and strainer service.

Section XIII. WINDSHIELD WIPER ASSEMBLIES

77. General

This section describes the maintenance and service procedures on the windshield wiper assemblies which are the responsibility of the operator

78. Windshield Wiper Blade Replacement

a. Removal. Remove the windshield wiper blades as instructed on figure 31.

b. Installation. Install the windshield wiper blades in reverse of the instructions on figure 31.

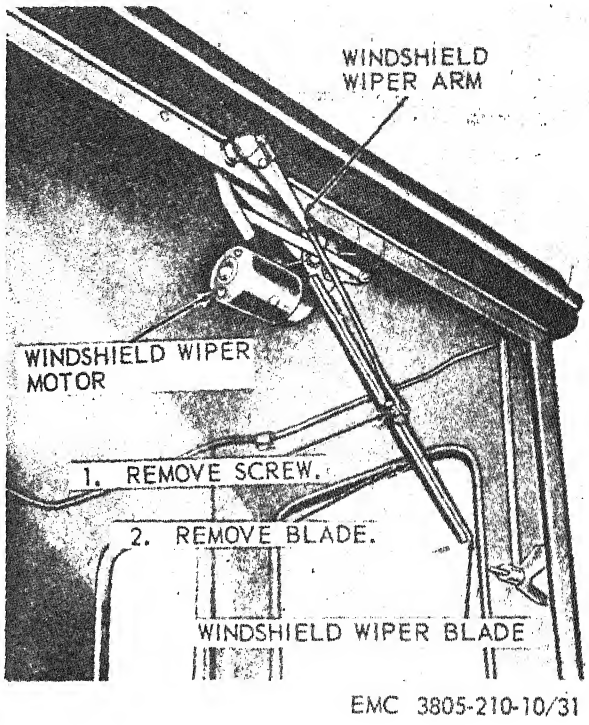


Figure 31. Windshield wiper blade, removal and installation.

Section XIV. SCARIFIER ASSEMBLY

79. General

The scarifier assembly is located behind the front axle of the grader. It consists of a scarifier block and 11 removable teeth. The scarifier is used to tear up material which is too hard to cut with the blade.

80. Scarifier Adjustment

Adjust the scarifier as instructed on figure 32.

81. Scarifier Teeth Replacement

a. Removal. Remove the scarifier teeth as instructed on figure 33.

b. Installation. Install the scarifier teeth in reverse of the instructions on figure 33.

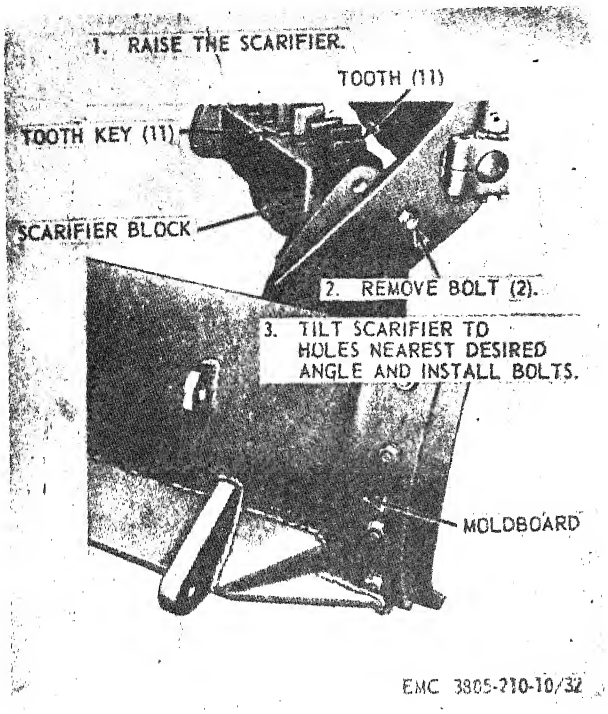


Figure 32. Scarifier adjustment.

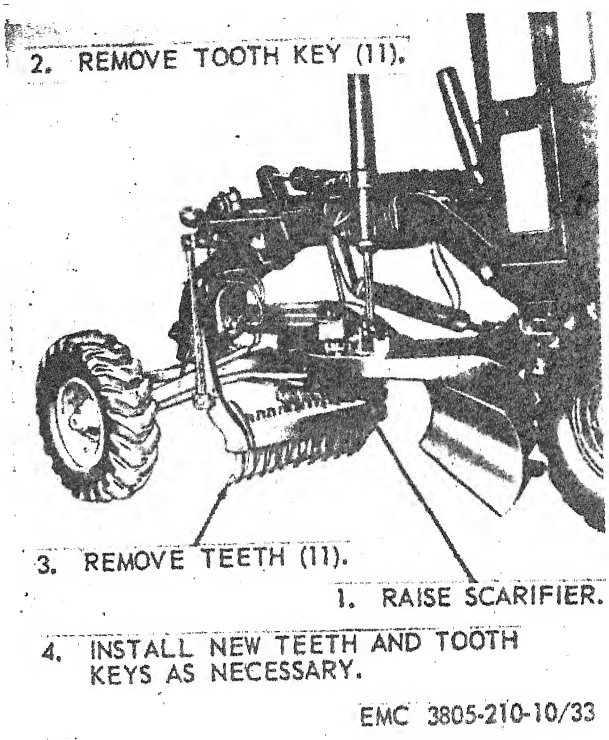


Figure 33. Scarifier teeth replacement.

Section XV. MOLDBOARD ASSEMBLY

82. General

The moldboard assembly is located behind the scarifier assembly and below the circle turn assembly. It is 12 feet long and consists of moldboard, a cutting blade, and two sets of end bits. The blade is mounted on the lower edge of the moldboard and is the cutting edge used in grading. The end bits are located on each end of the moldboard and used in ditching operations.

83. Moldboard Cutting Blade and End Bit Replacement

a. Removal. Remove the cutting blade and end bits as instructed on figure 34.

b. Installation. Install the cutting blade and end bits in reverse of the instructions on figure 34.

84. Moldboard Tilt Adjustment

Adjust the moldboard tilt setting as instructed on figure 35.

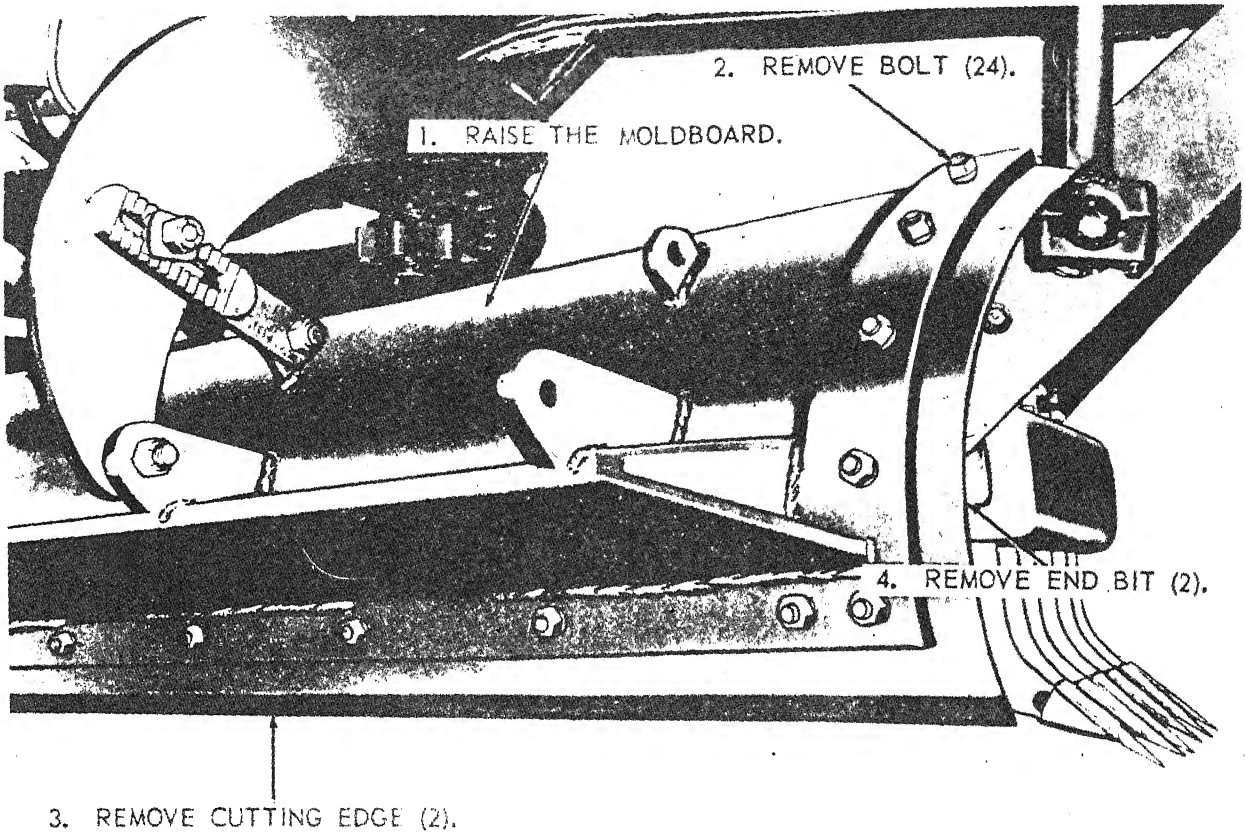


Figure 34. Moldboard cutting blade and end bit, removal and installation.

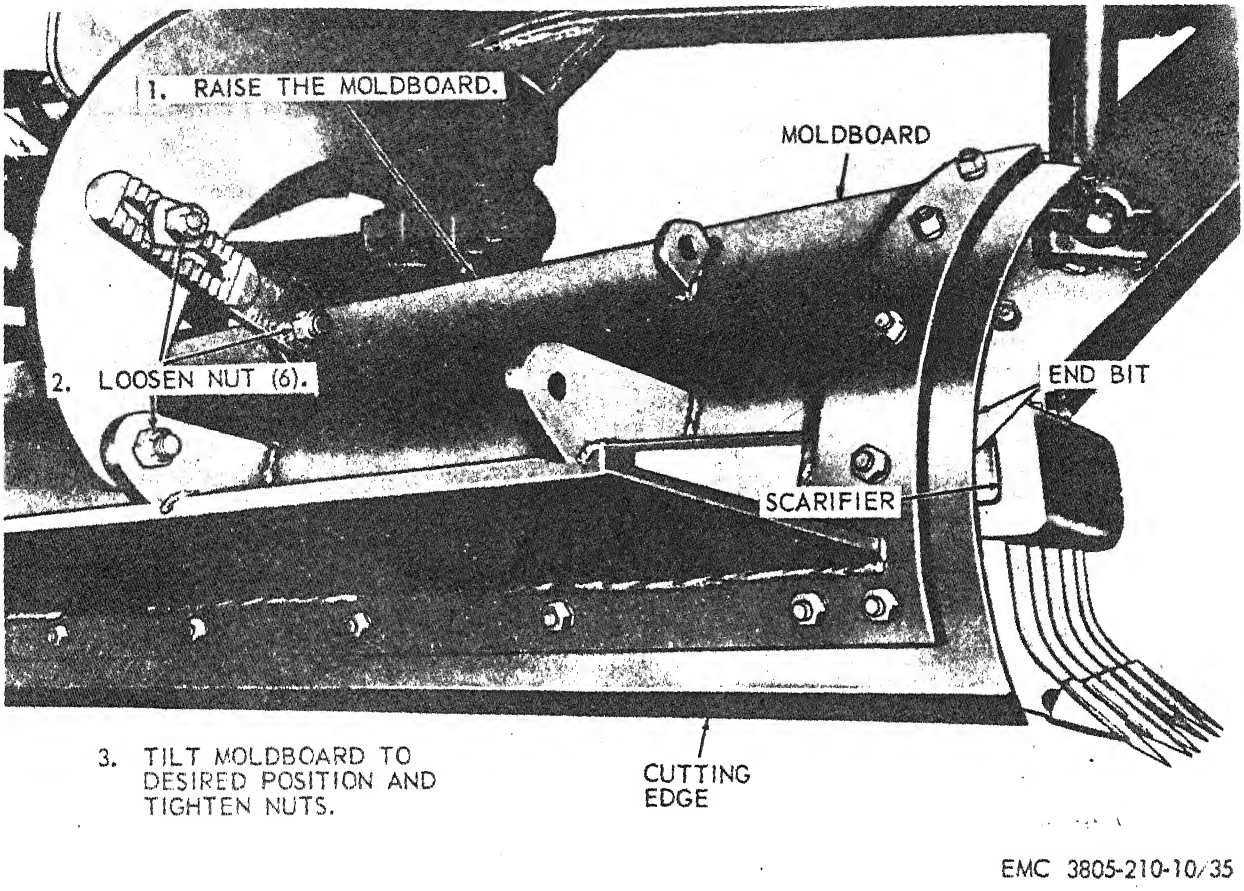


Figure 35. Moldboard tilt adjustment.

Section XVI. WINTERIZATION EQUIPMENT

85. General

This section describes the maintenance procedures and service of the winterization equipment which are the responsibility of the operator. These are the heater fuel pumps and filters.

86. Heater Fuel Pump Service

Service the heater fuel pumps as instructed on figure 36.

87. Heater Fuel Filter Service

Service the heater fuel filters as instructed on figure 37.

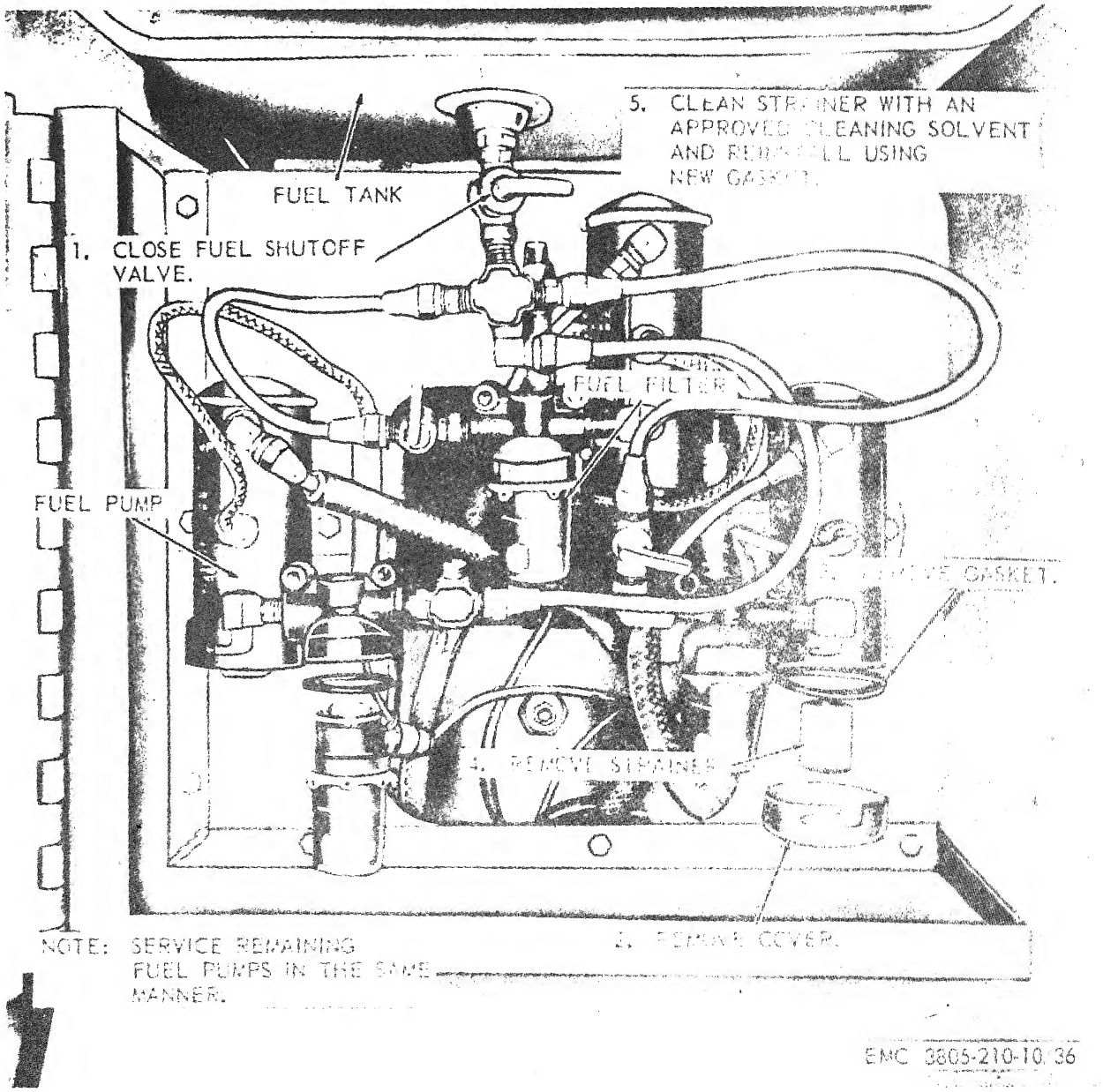


Figure 36. Heater fuel pump service.

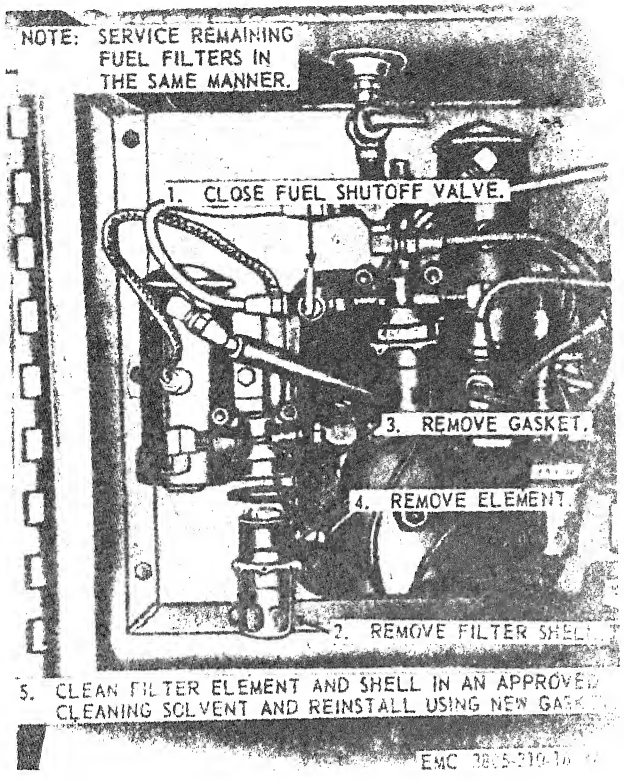


Figure 37. Heater fuel filter service.

CHAPTER 4
DEMOLITION OF MATERIEL TO PREVENT ENEMY USE

88. General

When capture or abandonment of the grader to an enemy is imminent, the responsible unit commander must make the decision either to destroy the equipment or to render it inoperative. Based on this decision, orders are issued which cover the desired extent of destruction. Whatever method of demolition is employed, it is essential to destroy the same vital parts of all graders and all corresponding repair parts.

89. Demolition to Render The Engine Inoperative

a. Demolition by Mechanical Means. Use sledge hammers, crow-bars, picks, axes, or any other heavy tools which may be available to destroy the following:

(1) Engine block and manifold.
(2) Governor and water pump.
(3) Radiator, starter motor, and generator.

Note. The above steps are minimum requirements for this method.

(4) Instrument panel, hydraulic controls, steering gear assembly.

b. Demolition by Misuse. Perform the following to render the engine inoperative.

(1) Drain radiator and engine crankcase. Put sand, gravel, nuts, bolts, screws, or broken glass in the crankcase and operate engine on full throttle until failure occurs.
(2) Disconnect radiator fan and run engine at full throttle for piston and ring seizure.

Note. (1) and (2) above are minimum requirements for this method.

90. Demolition by Explosives or Weapons Fire

a. Explosives. Place as many of the following charges (fig. 38) as the situation permits and detonate them simultaneously with detonating cord and a suitable detonator.

(1) Two 1/2-pound charges behind starter on side of engine block.
(2) Two 1/2-pound charges on each tandem drive case.

Note. The above charges are the minimum requirements for this method.

(3) Two 1/2-pound charges under steering gear housing.

b. Weapons Fire. Fire on the grader with the heaviest practical weapons available.

91. Other Demolition Methods

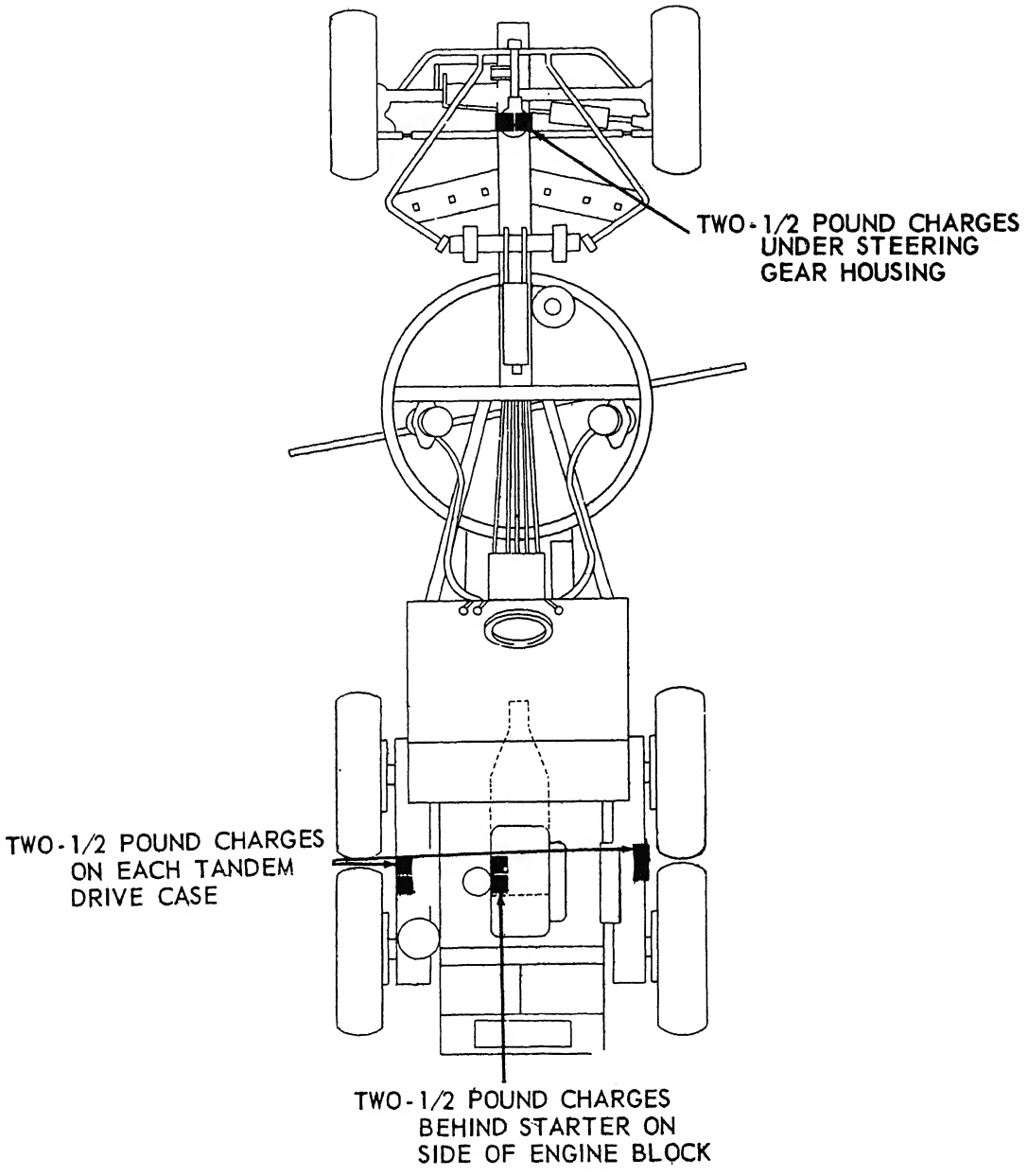
a. Scattering and Concealment. Remove all easily accessible parts such as the fuel transfer pump, governor, generator, and starter motor. Scatter them through dense foliage, bury them in dirt or sand, or throw them in a lake, stream, or other body of water.

b. Burning. Pack rags, clothing, or canvas under, around, and inside the grader. Saturate this packing with gasoline, oil, or diesel fuel and ignite.

c. Submersion. Totally submerge the grader in a body of water to provide water damage and concealment. Salt water will damage metal parts more than fresh water.

92. Training

All operators should receive thorough training in the destruction of the grader. Refer to FM 5–25. Simulated destruction, using all the methods listed above, should be included in the operator training program. It must be emphasized in training that demolition operations are usually necessitated by critical situations when time available for carrying out destruction is limited. For this reason, it is necessary that operators be thoroughly familiar with all methods of destruction of equipment and be able to carry out demolition instructions without reference to this or any other manual.



LEGEND: ■1/2 POUND CHARGE

EMC 3805-210-10/38

Figure 38. Placement of charges.

APPENDIX I
REFERENCES

1. Dictionaries of Terms and Abbreviations

AR 320–5	Dictionary of United States Army Terms
AR 320–50	Authorized Abbreviations and Brevity Codes

2. Fire Protection

TM 5–687	Repairs and Utilities: Fire Protection Equipment and Appliances; Inspections, Operations, and Preventive Maintenance
TM 9–1799	Ordnance Maintenance: Fire Extinguishers

3. Lubrication

LO 5–3805–210–20	Grader, Road, Motorized: Diesel Driven; 12,100 to 14,300 lb Pressure at Blade; (Huber-WARCO Model 4D)

4. Painting

TB ENG–60	Preservation and Painting of Serviceable Corps of Engineers Equipment

5. Preventive Maintenance

AR 750–5	Organization, Policies, and Responsibilities for Maintenance Operation
TB ENG 347	Winterization Techniques for Engineer Equipment
TM 9–1870–1	Care and Maintenance of Pneumatic Tires
TM 9–6140–200–15	Operation and Organizational, Field, and Depot Maintenance: Storage Batteries, Lead-acid Type
TM 38–750	The Army Equipment Records System and Procedures

6. Publication Indexes

DA Pam 310–4	Index of Technical Manuals, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders

7. Supply Publications

SM 10–1–C4–1	Petroleum, Petroleum-Base Products, and Related Material

8. Training Aids

FM 5–25	Explosives and Demolitions

APPENDIX II
BASIC ISSUE ITEMS LIST

Section I. INTRODUCTION

1. General

This appendix lists the accessories, tools, and publications required in 1st echelon maintenance and operation, initially issued with, or authorized for, the grader.

2. Explanation of Columns

a. Source Codes. The information provided in each column is as follows:

(1) *Technical service.* This column lists the basic number of the technical service assigned supply responsibility for the part. The blank spaces denote Corps of Engineers supply responsibility. General Engineer supply parts are identified by the letters "GE" in parentheses, following the nomenclature in the description column. Other technical services basic numbers are:

8—Chemical Corps
9—Ordnance Corps
10—Quartermaster Corps
12—Adjutant General's Corps

(2) *Source.* The selection status and source of supply for each part are indicated by one of the following code symbols:

(*a*) P—applied to high-mortality repair parts which are stocked in or supplied from the technical service depot system, and authorized for use at indicated maintenance echelons.

(*b*) P1—applied to repair parts which are low-mortality parts, stocked in or supplied from technical service depots, and authorized for installation at indicated maintenance echelons.

(3) *Maintenance.* The lowest maintenance echelon authorized to use, stock, install, or manufacture the part is indicated by the following code symbol:

O—Organizational Maintenance (1st and 2d Echelon)

b. Federal Stock Numbers. When a Federal stock number is available for a part, it will be shown in this column and used for requisitioning purposes.

c. Description.

(1) The item name and a brief description of the part are shown.

(2) The letters "GE", shown in parentheses immediately following the description indicate General Engineer supply responsibility for the part.

d. Unit of Issue. Where no abbreviation is shown in this column, the unit of issue is "each".

e. Expendability. Those items classified as nonexpendable are indicated by letters "NX". Items not indicated by "NX" are expendable.

f. Quantity Authorized. This column lists the quantities of repair parts, accessories, tools, or publications authorized for issue to the equipment operator or crew as required.

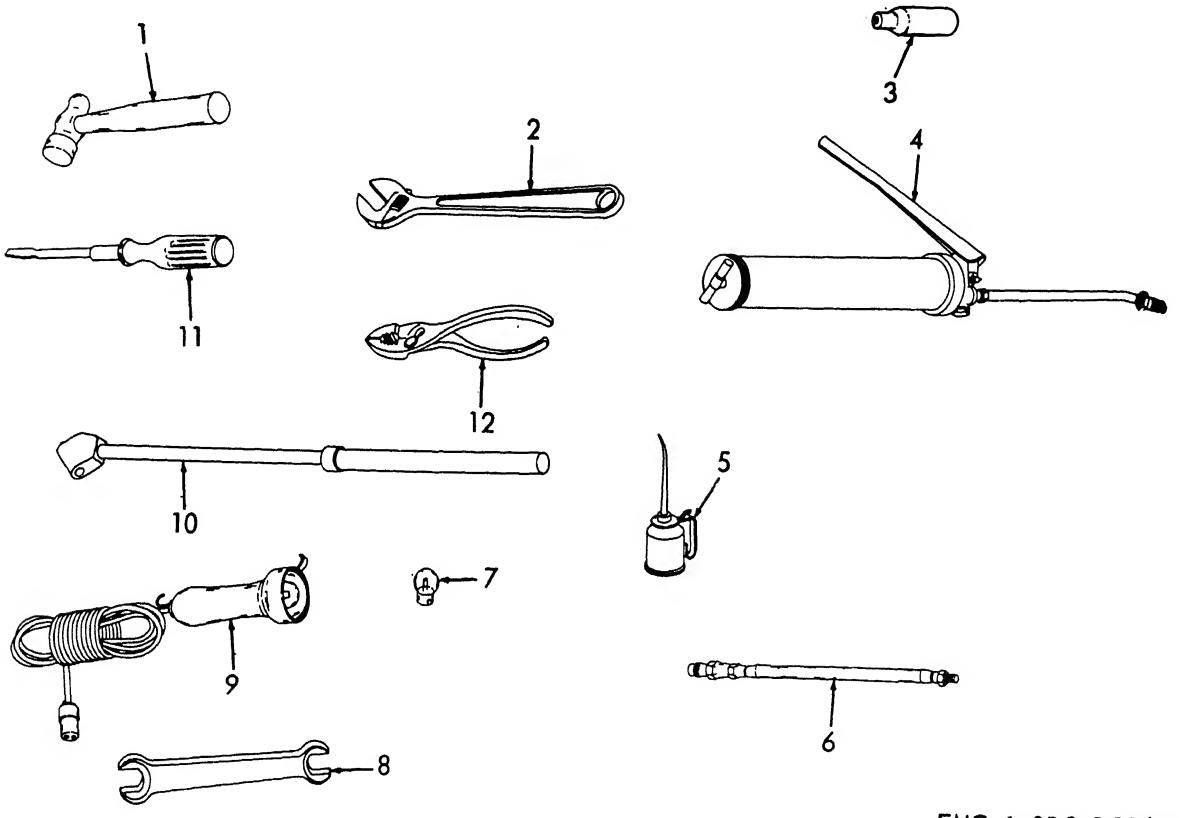
g. Quantity Issued With Equipment. This column lists the quantities of repair parts, accessories, tools, or publications that are initially issued with each item of equipment. Those indicated by an asterisk are to be requisitioned through normal supply channels as required.

h. Illustrations. This column is subdivided into two columns which provide the following information:

(1) *Figure number.* Provides the identifying number of the illustration.
(2) *Item number.* Provides the referenced number for the part shown in the illustration.

3. Comments and Suggestions

Suggestions and recommendations for changes to the Basic Issue Items List shall be submitted on DA Form 2028 to the Commanding Officer, U.S. Army Engineer Maintenance Center, ATTN: EMCDM–S, P.O. Box 119, Columbus 16, Ohio. Direct communication is authorized.



1 Ball-peen hammer
2 Adjustable wrench
3 Ether cartridge
4 Grease gun
5 Oil can
6 Grease hose
7 Lamp
8 Open end wrench
9 Extension light
10 Tire gage
11 Screwdriver
12 Slip joint pliers

Figure 39. Basic issue items.

Section II. BASIC ISSUE ITEMS LIST

Source codes			Federal stock No.	Description	Unit of issue	Expendability	Quantity authorized	Quantity issued with equipment	Illustration	
Technical service	Source	Maintenance Recoverability							Fig.	Item
				GROUP 06 ELECTRICAL SYSTEM (ENGINE AND VEHICULAR)						
				0612—BATTERIES						
9	P1	O	6140–057–2554	BATTERY, STORAGE: 12 volt; 100 amp (Specify Willard or Exide batteries when ordering for winterized units.)		NX	4	4		
9	P	O	6810–264–9063	SULPHURIC ACID: electrolyte.	Gal		7	7		
				GROUP 26—ACCESSORIES, PUBLICATIONS, TEST EQUIPMENT AND TOOLS						
				2602.1—ACCESSORIES						
10	P	O	7520–559–9618	CASE: operation and maintenance publications, cotton duck, water repellent and mildew resistant MIL–B–11743–B.			1	1		
	P1	O	2910–355–6377	PRESSURE PRIMER: diesel engine (GE) (Winterized Units).			1	*	39	3
	P	O	6240–155–7795	LAMP, INCANDESCENT: 28 V, 15 CP, No. 306 clear.			1	*	39	7
	P1	O	6230–268–9435	LIGHT, EXTENSION: 2 conductor cable, 12 ft long.			1	*	39	9
				2602.2—COMMON TOOLS						
10	P1	O	5120–224–4046	HAMMER, HAND: machinist ball-peen; 20 oz; head weight.			1	*	39	1
10	P1	O	5120–264–3796	WRENCH, OPEN END, ADJUSTABLE: single head type; 0 to 1.322 in. jaw opening; 12 in. long.			1	*	39	2
10	P1	O	4930–360–2801	GREASE GUN, HAND: lever operated, 16 oz capacity; extension, 7 in. long and hydraulic coupler MIL–G–3859.			1	*	39	4
10	P1	O	4930–430–3264	HOSE, GREASE: 20 in. long			1	*	39	6
9	P1	O	4910–261–8408	GAGE, TIRE PRESSURE, SELF-CONTAINED: 10 lb to 160 lb range, 12–1/2 in. long.			1	*	39	10
10	P1	O	5120–223–7396	PLIERS, SLIP JOINT: straight hose type, combination w/cutters; 6 in. long.			1	*	39	12
10	P1	O	4930–168–3264	OILER, HAND: 8 oz capacity, force fed.			1	*	39	5
10	P1	O	5120–230–3675	SCREWDRIVER, FLAT TIP: 1/4 in. width tip; 6 in. long.			1	*	39	11
10	P1	O	5120–277–9818	WRENCH, OPEN END, FIXED: double head type; 1–1/2 in. and 1–3/4 in. openings; 16–1/2 in. long.			1	*	39	8

Source codes				Federal stock No.	Description	Unit of issue	Expendability	Quantity authorized	Quantity issued with equipment	Illustration	
Technical service	Source	Maintenance	Recoverability							Fig.	Item
					2602.4—PUBLICATIONS						
12					DEPARTMENT OF THE ARMY OPERATORS MANUAL TM 5–3805–210–10			2	2		
12					DEPARTMENT OF THE ARMY ORGANIZATIONAL MAINTENANCE MANUAL TM 5–3805–210–20			2	2		
12					DEPARTMENT OF THE ARMY ORGANIZATIONAL MAINTENANCE REPAIR PARTS AND SPECIAL TOOL LIST TM 5–3805–210–20P			2	2		
12					DEPARTMENT OF THE ARMY LUBRICATION ORDER LO 5–3805–210–20			1	1		
					GROUP 76						
					FIREFIGHTING EQUIPMENT						
					7608—FIRE EXTINGUISHERS						
	P1	O		4210–223–9915	EXTINGUISHER, FIRE, CARBON DIOXIDE: std charged; hand; shatterable cylinder; permanent shutoff valve.			(SEE NOTE)			
	P1	O		4210–555–8937	EXTINGUISHER, FIRE MONOBROMOTRIFLUOROMETHANE: charged, hand-shatterable cylinder, penetrating seal valve, stored pressure, w/bracket, 2.75 lbs (Harlon-1801) Mil Spec E–52081. (GE) Note. Requisition carbon dioxide extinguisher until Depot stocks are exhausted.			1	*		

INDEX

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  5–117
  5–118
  5–127
  5–145
  5–146
  5–155
  5–156
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  5–278 (5)
  5–279
  5–420
  5–425
  5–427
  5–500 (EA, EB, HD–HG)
  5–600
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  5–627
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  17–100
  37–100
  39–51
  39–61

NG: State AG (3).
USAR: Same as active Army except allowance is one copy each unit.
For explanation of abbreviations used, see AR 320–50.

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SAFETY PRECAUTIONS

BEFORE OPERATION

Exercise care in handling fuel. Do not fill fuel tank with engine running. Ground the fuel container to the grader to avoid igniting fuel vapors with a static spark.

Clean excess grease, oil, and spilled fuel from the grader to avoid accidents by slipping or falling.

Do not clean, service, or make adjustments with the engine running unless absolutely necessary.

When inflating tires, stand clear of the lockring to avoid injury if it should be forced from the rim.

Be sure the grader is properly blocked and brakes set when inspecting or servicing underneath.

Do not allow flame or smoking around flammable materials when servicing the grader.

Use caution when filling batteries as electrolyte may cause serious burns if spilled on the body.

DURING OPERATION

Do not make sharp turns at high speeds. Overturning the grader could result in serious injury.

Do not dismount from the grader without first lowering blade and setting brakes.

Be sure there are no obstructions or personnel in the direction of travel before moving grader.

Do not clean, service, or make adjustments with the engine running unless absolutely necessary.

Keep the transmission and clutch engaged while traveling down steep grades to avoid losing control of the grader

If the grader engine is operated in an inclosed area, pipe the exhaust gases to the outside.

AFTER OPERATION

Before dismounting from the grader, lower the blade and engage the brakes.

Stop the engine before cleaning, servicing, or adjusting the grader unless engine operation is absolutely necessary.

Clean all excess grease, oil, and spilled fuel from the grader surfaces to prevent injury by slipping or falling.

When inflating tires, stand clear of the lockrings to avoid injury should the lockring be forced off.

Do not allow flame or smoking aroud flammable material while servicing the grader.

Before making adjustments or servicing the underside of the grader, provide adequate blocking and engage the brakes.

Use caution when removing the radiator cap to avoid burns from steam.